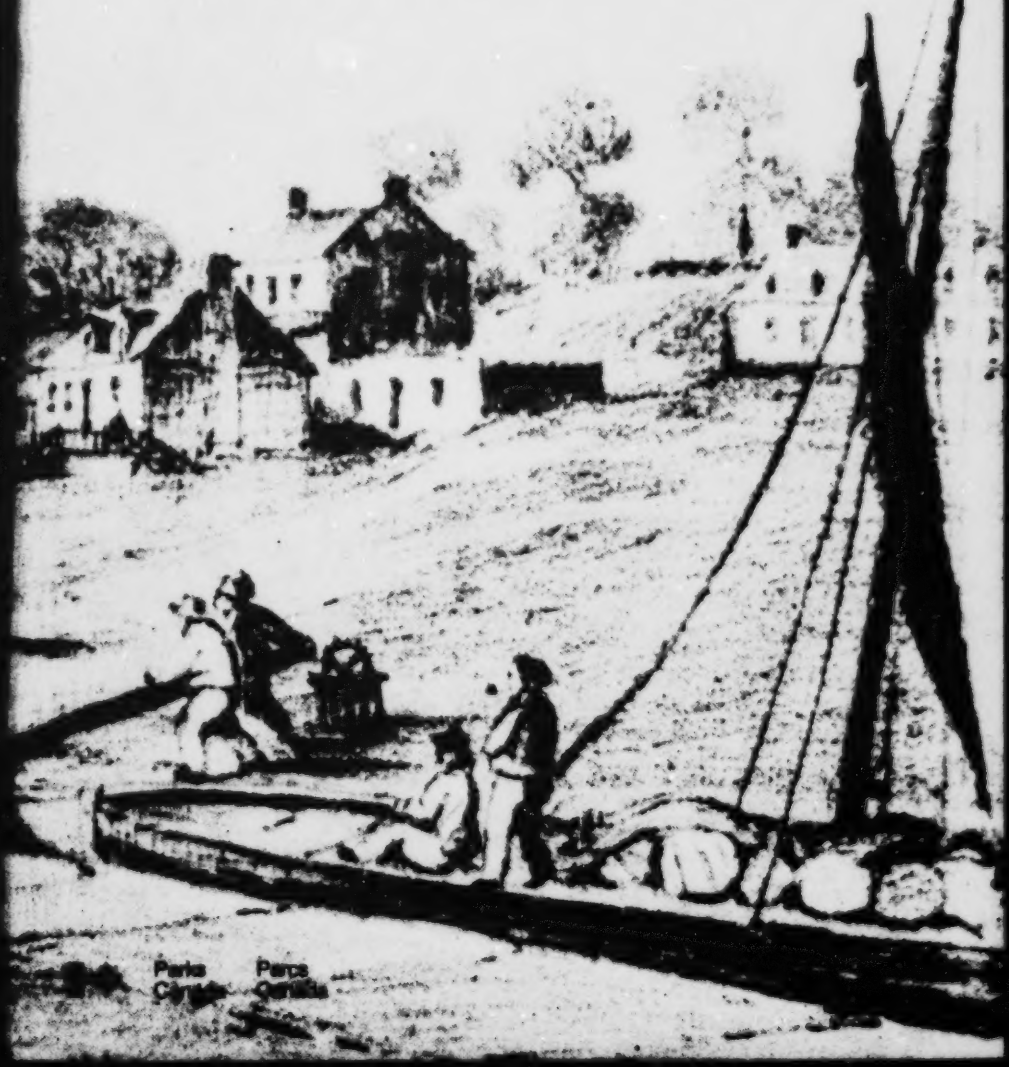
The Ottawa River Canal System

Normand Lafrenière



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Cover: Sketch of the village of Carillon in 1850 showing the method of opening the lock gates. (Public Archives of Canada.)

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SUMMARY

The aim of this study is to present a brief history of the Ottawa River canal system from the time construction began until 1963. Although the Carillon Canal (a national historic park) would normally have been the focal point of such an undertaking, a specific study of this canal proved virtually impossible owing to the lack of information pertaining to its initial construction period. Records of the commercial use of the canal over the years were equally sparse. Fortunately, however, the history of the Carillon Canal is closely linked with that of several other canals (the Vaudreuil, St. Anne's, Chute-à-Blondeau, and Grenville canals) constructed on the lower Ottawa River in the early 19th century. As a consequence this study encompasses the entire Ottawa River canal system.

ACKNOWLEDGEMENTS

A project of this kind, with the extensive research it entails, could not have been carried out without assistance. I wish to thank research assistants Nicole Castéran, Denis Dubé, Marie-Claire Dufresne, and Pierrette St-Onge for their unstinting co-operation. I am indebted also to the staff of the Carillon Museum, who kindly allowed me access to their files and their photographic collection. Finally, special mention must be made of the invaluable co-operation of my colleague André Sévigny.

INTRODUCTION

Efforts to improve navigation on the Ottawa River began in the early years of the 19th century with the construction of a series of canals, of which the Carillon was one. Although built at about the same time and grouped within a relatively limited distance, these canals were constructed to serve different purposes. The locks at Vaudreuil and St. Anne's were intended purely for commercial use. The main section of the system, comprising the Carillon, Chute-à-Blondeau, and Grenville canals, was designed for the transport of troops and military matériel between Montreal and Kingston in the event of an American blockade of the St. Lawrence, as had been threatened during the War of 1812.

From the time the canals went into operation, however, their military purpose was overshadowed by their commercial role as there was no indication that a repetition of the events of 1812 was likely to occur. Because they had not been constructed primarily for commercial use their importance from this point of view was limited by a number of factors, including the monopoly exercised at the Vaudreuil lock at the downstream entrance to the system, the very reduced scale of navigation in the Grenville Canal, and in particular the opening of the St. Lawrence canals at the end of the 1840s. The Ottawa River canals could not compete with the new system for the Great Lakes traffic, and their use was thereafter restricted to local activity.

To gain a better perspective of the historical importance of the Ottawa River canal system, I have also looked at the use of the river before the canals were built. How far back does the use of this waterway go? What was the background to its canalization? What purposes was the canal system intended to serve? What were its main components? How and why were these altered over the years? To what extent was the system used for commercial purposes? These are the main questions examined in this study of the Ottawa River canal system. It comprises five chapters, the first of which presents a historiographical overview of the canalization of the Ottawa River.

The second chapter reviews the history of the Ottawa River before the building of the canals, from the point of view of the geographical context, the fur trade, and commercial navigation.

The heart of the subject is in the third chapter, which deals with the construction period of each of the canals comprising the Ottawa River system. In this structural review can be seen the extent to which the Carillon Canal was dependent on several other canals built along the same route at about the same time. The chapter is not limited to a simple description of the canals, but examines the purpose each was constructed to serve, as well as the political and economic context in which the work was carried out. It concludes with a discussion of the impact that the construction of the military canal system had on its immediate environment and the reasons that led to the transfer of its administration to the Canadian government in 1856.

Continuing the analysis begun in the preceding chapter, the fourth chapter examines the structural development of the Ottawa River canal

system throughout its history. The fifth and last chapter is devoted entirely to the commercial use of the Ottawa River canals from their opening until 1969. To cover this theme it was necessary to know who the principal users of the system were. The goods transported are analysed in terms of the three main periods that the system was in commercial use, and the users are dealt with according to their relative importance in a chronological perspective.

This is not, of course, an exhaustive study, but merely an initial review. Through documentary research and reference to secondary sources, however, I have uncovered a certain amount of new and hitherto unpublished material which throws fresh light on the relative importance of the various components of the Ottawa River canal system.

HISTORIOGRAPHICAL OVERVIEW OF THE OTTAWA RIVER CANAL SYSTEM

Although the fur trade and the development of the lumbering industry in the Ottawa Valley have attracted the interest of many historians, the same cannot be said of the canalization of the Ottawa River. In this historiographical overview of the Ottawa River canal system, I present a brief examination of the main articles and research papers published on the subject. In an effort to trace the principal historiographical trends (if such existed), I have elected to examine the liteature in the order of its publication and to classify it under the headings of general material, theses, magazine articles, and specific studies. For further information regarding the bibliographic reference of each of the authors cited, please consult the bibliography at the end of the paper. Also included in this historiographical summary is a list of the main primary sources consulted.

General Material

All material that does not deal specifically with the canal system has been grouped under the heading of general material.

In 1933 J. Graham published *The Water Highway of Argenteuil and Its Centennial Anniversary*. This commemorative booklet contains an impressive collection of anecdotes relating mainly to the work force and the construction of the military canal system on the Ottawa River. The presentation is quite factual, however, with no effort at interpretation. The sources, moreover, seem questionable in that the author has relied primarily on oral tradition in compiling the booklet.

Four socioeconomic studies were very useful in analysing the circumstances surrounding the construction and use of the Ottawa River canals. These were *The Commercial Empire of the St. Lawrence 1760-1850*, written in 1937 by Donald Creighton; *Canadian Economic History*, published in 1956 by Easterbrook and Aitken; *Histoire économique et sociale du Québec, 1760-1850* by Fernand Ouellet (1971), and finally, *Histoire économique du Québec, 1851-1896* by Hamelin and Roby (1971). However, these studies do not deal with the canalization of the Ottawa River.

Under the headings of general material, Robert Legget's book *Ottawa Waterway, Gateway to a Continent*, published in 1975, contributed the most to the historiography. In his chapter entitled "Canals and Steamboats," Legget gives a brief historical account of various aspects of the construction of the Ottawa River canals. The only criticism one might make of the book is that it does not deal with the commercial use of the canals. This area, moreover, is given only cursory examination in the secondary sources.

Theses

After consulting numerous listings, including *Canadian Theses* for the years 1947-73, the *Register of Postgraduate Dissertations in Progress in History and Related Subjects*, 1970-77, and finally, the *Inventory of Research in Progress in the Humanities* for the years 1921-46 and 1972, I was able to find only two theses that dealt, in part, with the Ottawa River canal system.

John Ross Mackay's 1949 thesis on "The Regional Geography of the Lower Ottawa Valley" reveals disappointing weaknesses from a historical point of view. Mackay confines himself to a brief discussion of the structural aspects of the canal system in the chapter entitled "Development of Transportation." In another chapter entitled "Economic Activities," he provides some very significant statistics illustrating the commercial decline of the Ottawa River canals, but unfortunately he devotes scarcely a page to this topic.

A more recent thesis, presented in 1972 by V. Alan George under the title "The Rideau Corridor: The Effect of a Canal System on a Frontier Region, 1832-1895," though concerned mainly with the Rideau Canal, points up the close relationship that existed between that canal and the Ottawa River system. Drawing in large part on primary sources, it provides a detailed interpretation of the commercial role of the Ottawa River canals between 1832 and 1850. In the chapter on passenger transportation, moreover, it touches upon a previously unknown aspect of the historiography relating to the use of these canals for the transportation of British immigrants on their way to Upper Canada between 1840 and 1848. Apart from this study by V. Alan George, therefore, writers of historical theses have given scant attention to the subject of the Ottawa River canal system.

Magazine Articles

An extensive review of the main periodicals revealed a surprising lack of interest on the part of researchers in the theme of the Ottawa River canals. A list of the periodicals scanned appears below. Some individual issues (of other periodicals or research bulletins), to which reference is made in very selective bibliographies, will be commented on in the order of their publication.

American Historical Review, 1895-1967
Bulletin des recherches historiques, 1895-1967
Le Cahier des dix, 1935-77
Le Canada-Français, 1888-91; 1918-26
Canadian Geographical Journal, 1930-78
Histoire Sociale, 1968-72
Ontario History, later *Ontario Historical Society: Papers and Records*, 1899-1962

The Ottawa Naturalist, 1879-1906
Revue d'Histoire de l'Amérique française, 1947-72

One component of the system which did prove to be of continuing interest to researchers until 1940 was the Vaudreuil lock, located at the downstream entrance to the waterway.

In 1908 Ernest Marceau published "Les origines des canaux du Canada" in *Revue Canadienne*. Drawing on oral sources of information, this article sheds new light on the commercial monopoly exercised at the Vaudreuil lock. In "Steam Navigation on the Ottawa River," which appeared in *Ontario Historical Society: Papers and Records* in 1926, H.R. Morgan continues Marceau's study and recounts the circumstances that brought the commercial monopoly at Vaudreuil to an end. Some further details are added by R.W. Shepherd in an article entitled "Steam Navigation on the Ottawa River," published in *Canadian Railroad Historical Association* in 1940.

Raoul Blanchard's article "Les Pays de l'Ottawa," published in 1949 in *Revue de Géographie Alpine*, deals very explicitly with the reasoning behind the Ottawa River canalization project. It also discusses the impact of the project on the settlement of the area, which was largely a result of immigration from Ireland.

A 1963 article in the *Canadian Geographical Journal* entitled "Submerged History of the Long Sault," by H. Lambart and G.R. Rigby, examines an aspect previously overlooked in the historiography, namely the existence of a primitive canal system located on approximately the same site as the existing system. The article also contains a brief description of vestiges of the military canals that could be seen at that time.

In "The Ottawa River Canals and Portage Railways," which appeared in *DBR/NRC Technical Paper* in 1971, R.F. Legget presents a short history dealing mainly with the initial construction period of the canal system. Legget highlights the principal difficulties encountered in the excavation of the Grenville Canal and briefly describes the work force assigned to the project. He also touches upon the objections raised to the expropriations required for the construction of the military canals.

George Raudzens' article, "The Military Impact on Canadian Canals, 1815-1825," published in the *Canadian Historical Review* in 1973, contains an analysis of the means, or indeed the intrigues, to which the British officers and governors resorted to gain acceptance of their military canal project on the Ottawa River. Raudzens' study is based on an extensive knowledge of the military records of the pre-canalization period.

In 1979 Raudzens published a much more complete study on the subject entitled *The British Ordnance Department and Canada's Canals, 1815-1855*. This more recent work was unfortunately not available at the time this report was written.

Reginald Rigby, co-author of the previously mentioned "Submerged History of the Long Sault," returns to the subject of the primitive canals in an article produced with Robert F. Legget under the title "Riddle of the Treadwell Trenches," which appeared in the *Canadian Geographical*

Journal in 1974. These two specialists in the historical use of the Ottawa River describe in considerable detail the dimensions and the locations of the early canals and offer a series of hypotheses with regard to their construction.

Specific Studies of Canals

G.P. de T. Glazebrook's study, *A History of Transportation in Canada*, published in 1938 and reissued in 1964 and 1970, undoubtedly remains the most complete work on the subject. The author examines the various modes of transport from the beginning of the French regime to the end of the 1930s. Considering the scope of his analysis, it would be unfair to accuse Glazebrook of an overly general treatment of the Ottawa River canal system. He provides a particularly clear interpretation of the circumstances existing prior to the constructon of the first canals on the Ottawa in the chapter entitled "Sail and Steam."

Under the heading of specific works, John P. Heisler's 1971 study, *The Canals of Canada*, is considerably more precise than Glazebrook's in that it focuses on canal construction in Canada. Although Heisler deals with the financing of the Ottawa River canal system and the problems involved in acquiring the land, he is primarily concerned with the defence aspect of the system. Like most of the authors referred to above, he completely omits any discussion of the commercial use of the canals.

The foregoing summarizes our historiographical overview of the Ottawa River canals. Except for some slight emphasis on the Vaudreuil lock in the work done by Marceau (1908), Morgan (1926), and Shepherd (1940), the various studies published in the first half of the 20th century deal with the waterway mainly from the point of view of defence. With the exception of Glazebrook's book (1964), these short studies reflect little sustained effort, and the information they contain is, in most cases, anecdotal.

In the early 1970s there was a revival of interest in the history of the Ottawa River canal system. A few studies, including those by Heisler (1971) and Legget (1975), give evidence of a genuine effort at interpretation, but even these are incomplete in that they fail to deal with the commercial use of the canals. The 1972 study by George merits special attention as the only one to touch upon this aspect, but it offers only a limited analysis of a very short period (1932-50). The commercial use of the canal system and its impact on the area are thus the principal omissions revealed in this survey of secondary sources.

Main Primary Sources Consulted

In an effort to compensate for the deficiencies of the secondary sources, I consulted a number of Ottawa Valley newspapers on file in the

Public Archives. The following is a complete list of these newspapers in alphabetical order:

Argenteuil Advertiser (Lachute), 1872-77
Argenteuil County News (Lachute), 1895-96
British Whig (Kingston), 1847-1955
Bytown Gazette, 1836-49, 1852, 1854, 1856-58
Le Courrier d'Outaouais (Hull), 1861-62, 1870-76
Herald (Prescott), 1837
The Independent (Lachute), 1888-91
L'Interprète (Montebello), 1886
Lachute News, 1895
L'Outaouais (Hull), 1892
Prescott Journal, 1890, 1916-17
Progress (St. Andrew's), 1872-75
Le Spectateur (Hull), 1889-90, 1909-13
La Vallée d'Ottawa (Hull), 1884-88
La Voix de l'Outaouais (Hull), 1902
Watchman and Ottawa Valley Advocate (Lachute), 1881-84, 1886-92, 1895-97, 1899, 1905, 1971

The results of this research were most disappointing. Only a few issues yielded any worthwhile information on the competition for business that existed between the railroads and the Ottawa River canals.

In the end, the *Sessional Papers* of the Province of Canada (1850-66) and of Canada (1867-1920) and the *Dominion Bureau of Statistics: Canal Statistics* (1921-1970) proved the most useful sources of information on the commercial use of the Ottawa River canals. From these sources, in fact, it was possible to make a very detailed compilation illustrating the traffic carried on the canals between 1850 and 1963.

By reference to the annual reports of the various federal departments responsible for the administration and operation of the canals, the structural development of the Ottawa River canals from 1840 to 1963 could be traced. These annual reports are listed below in order of publication.

Annual Report of the Department of Public Works, 1840-78
Annual Report of the Department of Railways and Canals, 1879-1936
Annual Report of the Department of Transport, 1937-70

The records series RG11 and RG43 contain a voluminous correspondence exchanged between the administrators in these different departments and the superintendents of the Ottawa River canals. The correspondence deals mainly with structural matters, but it occasionally yields information on the traffic, the work force, or some other topic directly or indirectly related to the canal system.

In addition, the military records series MG13, WO55, and RG8 are indispensable to a study of the origin and construction of the Ottawa River military canals. These records are unfortunately incomplete, as many of the documents were destroyed in a fire that severely damaged

the offices of the Royal Engineers in Montreal in 1852. Part of the correspondence dealing with the progress of the construction, however, was retranscribed in the *British Parliamentary Papers* (transcriptions of these documents are available at the Bibliothèque de la Législature de Québec).

I owe much more, therefore, to primary sources than to the various secondary sources consulted, which in general accord the subject of the Ottawa River canal system rather cursory treatment.

THE OTTAWA RIVER: PRE-CANALIZATION PERIOD

Geographical Description: Source and Lower Course

The Ottawa River, the main tributary of the St. Lawrence, rises in Lake Capimitchigama, a large body of water located some 155 miles (1 mile = 1.609 km) north of Ottawa, and follows a winding course for some 700 miles to its junction with the St. Lawrence. Its upper reaches connect with Lake Huron by the Mattawa River, Lake Nipissing, and the French River.

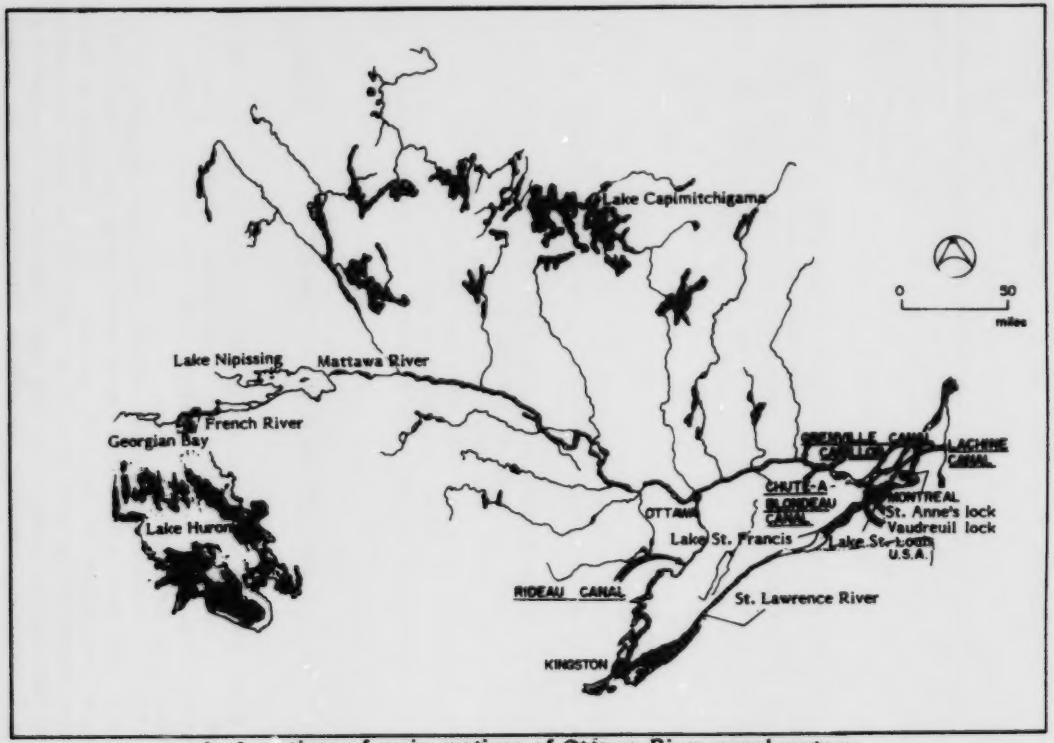
The canals that are the subject of this report, however, are grouped along the lower course of the Ottawa, over the last 60 miles upstream from Montreal (Fig. 1). Here the river tumbles over a series of rapids, the longest being those of the Long Sault which extend for more than 6 miles between the interprovincial bridge at Grenville and Greece's Point. The Long Sault, representing a drop of more than 46 feet (1 foot = 0.3048 m) and interspersed with rocks throughout its length, was long considered the main obstacle to navigation on the lower Ottawa River: "from St. Andrew's to Carillon and Grenville, a veritable sea of blocks towers some thirty metres above the bed of the Ottawa for several miles, indicating the presence of a vast outcrop of rocky shoals." [Translation.][1]

Before the canalization of the Ottawa, the natural obstacles to navigation included rapids at three other locations: Chute-à-Blondeau, Carillon, and St. Anne's. Building canals adjacent to the rapids was the obvious solution to the obstructed waterway, but this step was preceded by some much more modest expedients, including the establishment of three portages and the excavation of a number of primitive "canals."

Portages and Primitive "Canals"

Every traveller taking the Ottawa River route to the Great Lakes or merely to the "pays d'en haut," whether Indian, explorer, missionary, or *coureur des bois*, had to contend with the natural obstruction represented by the Long Sault rapids.

The locks bypassing the rapids did not make their appearance until the early 19th century, but a first step in establishing a way around these obstacles was taken in the 17th century. This consisted of three portages located on the north bank of the river, not far from the present site of the military canals. A second step followed after an interval of nearly 2 centuries, preceding the official canalization of the Ottawa River by only a few decades. This solution involved the construction of a series of canals which we will describe as primitive as only one of them boasted a lock. The historiography relating to this initial attempt at canal building is still sparse. Were it not for the study done by H.



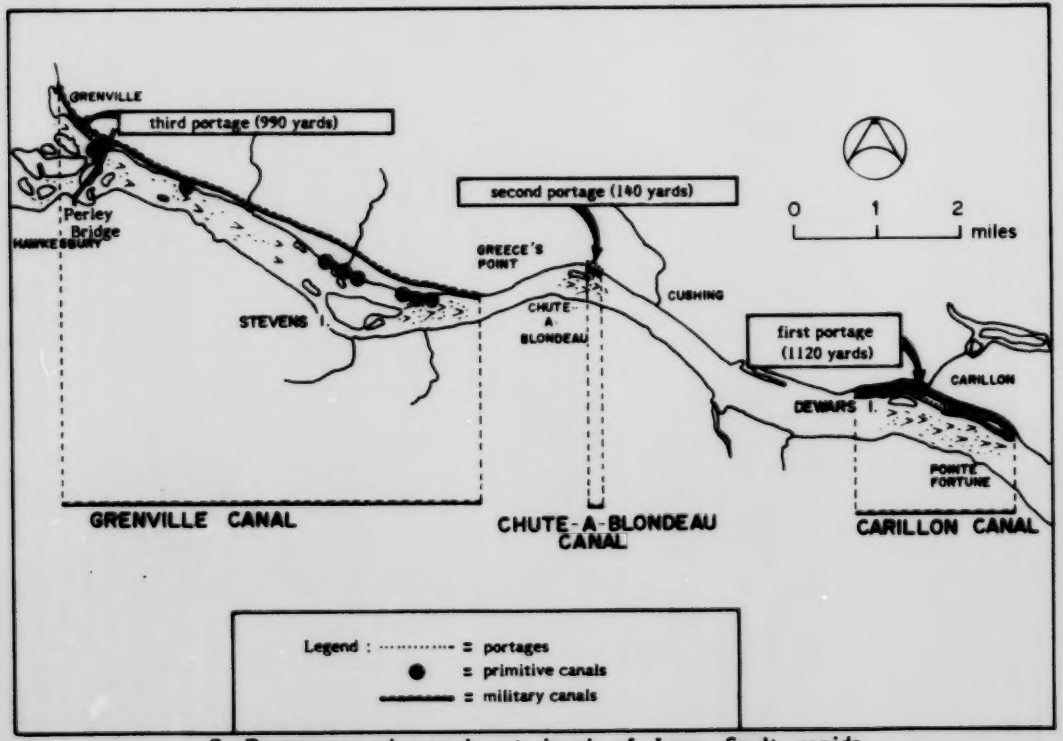
1 Locations of main sections of Ottawa River canal system.
(Drawing: François Pellerin.)

Lambart and G. Reginald Rigby,[2] the existence of this first canal system could easily have been forgotten as it was eventually submerged by the construction of the Carillon dam in 1963. The study by Lambart and Rigby thus takes on even greater importance, and I will be drawing on it extensively for this section on the portages and primitive "canals" constructed at the level of the Long Sault rapids.

Portages

The accounts by Lambart and Rigby, coupled with an analysis of an old 1788 map showing the north shore of the Ottawa River,[3] make it possible to pinpoint the location of the three portages fairly accurately (Fig. 2). Going upstream, a traveller would reach the first portage opposite Ile Persévérance (later Dewar's Island). It bore the name of "Les Petites Ecores," a reference to the outcrops and crevices to be seen on the north side of the escarpment along which the path was constructed. The word "écore" appears to be derived from "escore," current in 1671, which evolved into "accore," an archaism meaning the outline of a reef or shelf (*écueil*).[4] According to the 1788 map the portage crossed Chatham lots 5, 6, and 7 and was approximately 1120 yards (1 yard = 0.9144 m) long. Transposing the site to a modern map, Lambart and Rigby place it on the north bank of the Ottawa River near the base of the present Carillon dam.[5] The second portage, going upstream, was called Sault au Blondeau; it too was located on the north bank of the Ottawa, at the level of the future Chute-à-Blondeau lock. The Blondeau from whom the location apparently derived its name was said to have lost his life while trying to navigate the rapids.[6] Situated opposite Chatham lot 23, this portage measured approximately 140 yards. The last portage bypassing the Long Sault began where the end of the Grenville-Hawkesbury interprovincial bridge now stands and extended for some 990 yards, compensating a difference in level of about 15.5 feet. Notwithstanding the scale suggested by the 1788 map, it would seem that the length of the three portages may have varied considerably depending on the season; this can be gathered in any event from Alexander Mackenzie's observation that "in this distance are three carrying-places [the 'Trois Ecores'], the length of which depends in a great measure upon the state of the water, whether higher or lower."[7]

Another equally interesting detail is to be found on the 1788 map. A few feet upstream from the third portage, in the middle of the river, is the inscription "The Pass Down." This would appear from all evidence to be a passage through which canoists descended the rapids at this level, thus avoiding the third portage. It led between Hamilton and Perewig islands and then turned toward the south bank to clear the three rocks (les Trois Roches). No other passage is indicated on the map, which leads to the belief that the other two portages were also used for the return journey. Lambart and Rigby, who have examined a number of accounts of travel on the river, make this suggestion with caution, however:



2 Portages and canals at level of Long Sault rapids.
(Drawing: François Pellerin.)

Consideration of all the circumstances of the Carillon portage seems to confirm that this was the place of recognized strategic importance, the key to the navigation of the river, referred to by the 17th century historians as "the passage." All traffic going up the river came over this portage and, apparently, it also carried the traffic coming down.[8]

Primitive "Canals"

Although according to the most valid hypotheses these "canals" date from the early 19th century, their construction is extremely primitive, not to say archaic, for that period. They were in fact little more than trenches formed by the removal of some of the numerous large boulders found along the north bank of the Ottawa River in the vicinity of the Long Sault. These rocks must have been serious hazards to navigation as many of them were removed to allow the passage of canoes and other craft. Altogether eight "canals" formed in this way were observed by Lambart and Rigby within the confines of the Long Sault (Fig. 2).

The "canals" were submerged by the Carillon dam in 1963, but their existence is still a subject of speculation. Who could have moved boulders weighing in some cases nearly a ton (1 ton = 0.907 tonne)? What is the explanation of the drill marks found on some of them? I will attempt to answer these questions by looking at the first users of the waterway and the various hypotheses that have been proposed.

The suggestion that they were constructed by the Indians seems the least plausible of all and is in fact ruled out by the presence of drill marks between 7 and 10 inches (1 inch = 25.4 mm) deep in some of the rocks.[9] Next come the *coureurs des bois* and the voyageurs in the employ of the powerful fur companies; the shortness of the navigation season and the long distances they had to travel would not have left them much time to carry out such a project. Legget and Rigby refute this hypothesis, moreover, on the basis of their analysis of accounts by a number of travellers[10]; on the other hand they do not exclude the possibility that the "canals" were constructed by the North West Company itself. This too, however, is merely a hypothesis which can only be confirmed by a more thorough study of the company's correspondence.

A local historian, Cyrus Thomas, attributes the construction to Theodore Davis, a pioneer who settled in St. Andrew's in 1801 and became a land agent: "Another works [sic] of public utility he performed was removing boulders from the Ottawa above Carillon, so as to facilitate navigation."[11] Local tradition, however, gives the credit to Nathaniel Hazard Treadwell, an American from Plattsburg, who moved to the Ottawa Valley in 1798 and became the owner of the seigniory at Pointe à l'Orignal. Construction of these "canals," it is suggested, would have facilitated transportation of the output of his sawmill and his gristmill.

Although these three hypotheses have a degree of credibility, the explanations that follow involve the participation of groups much larger in number and certainly much better equipped to undertake such work. In March 1800 Philemon Wright, an American from Massachusetts, brought with him "five families from Woburn and twenty-six men he had hired specially. Included in the caravan were fourteen horses, eight cattle and five sleighs loaded with tools and provisions." [Translation.][12] With such equipment, these men could undoubtedly have moved the rocks blocking passage for canoes, but what would have been the purpose of doing so? Why would they have delayed their journey up the Ottawa River in midwinter, on the ice, to undertake such work? That they were preparing the way for other pioneers would still be only a partial answer.

The hypothesis that seems the most valid so far attributes the construction of these primitive "canals" to engineers of the Royal Staff Corps, who were later assigned the task of constructing the Carillon, Chute-à-Blondeau, and Grenville canals. Legget bases this hypothesis on very solid indications, this time, in that work on construction of the Ottawa River military canals began with the Grenville Canal in 1819; the obstacles necessitating the construction of the eight primitive "canals," moreover, were evenly distributed over the length of this canal. Legget concludes from this that the military personnel, while in the area, could have excavated these few trenches at the request of the pioneers; this would have greatly improved navigation pending completion of the canal system.[13] The fact that the equipment used by these army units was specifically designed for this type of work is a further interesting point. In my view the most convincing argument in support of the belief that the original "canals" were built by the military is to be found in the following recommendation contained in a report by Captain Mann on navigation on the Ottawa River in the area of the Long Sault:

> The part of the river between Stoddard's Island and the Trois Roches, an extent of two miles and a half, can be ascended by loaded batteaux, but not without some difficulty, as there are several short rapids to pass; some improvement, however, might be made without much expense, by clearing away the large stones which obstruct the passage. The channel is on the north bank during the spring, but on account of the numerous shoals, batteaux ascend the rest of the season on the south bank.[14]

Except for the foregoing extract, the military correspondence seems to make no reference to the existence of the primitive "canals," but this would not necessarily rule out the participation of army personnel. On the contrary, with the equipment they could have had the removal of the boulders might have been too simple a matter to warrant mention in their correspondence. The work would have provided uninterrupted navigation for small craft until the canal system was finally completed.

The Pointe Fortune Canal

Consider now the case of the Pointe Fortune canal, located opposite Carillon, on the south shore of the river (Fig. 2). It has been deliberately set apart from the section on the primitive "canals" because it was the only one of these to include a lock. The first document referring to this canal dates from 1818. In his report on navigation on the Ottawa River, Captain Mann describes it as follows:

> A bank of stones has been thrown up on the south shore, which forms a canal, into which batteaux are admitted by a lock; but as the bank does not retain the water, and the lock is not sufficiently deep, this work is, during the autumn, rather an obstruction than an assistance to the navigation.[15]

It would appear that this canal was constructed by John Macdonell, a local businessman, to facilitate transportation from his mills located nearby:

> Col. John Macdonell, whose home was in Point Fortune, although at one time his duties were in the west in connection with the Hudson Bay Co., built a canal of several rods in length with a lock to facilitate the passage of boats past the chute, which at that point was an obstruction to navigation. Col. Macdonell had a grist and a saw mill erected as well, also a storehouse which had an opening in the basement so that the boats could enter in, the cargoes being placed on platforms two or three feet high alongside of which the boats drew up.[16]

These, therefore, were the first attempts by man to conquer the natural obstacles that obstructed the course of the Ottawa River.

The Ottawa River and the Transport of Furs

Long before it was discovered by white men, the Ottawa River was travelled by Algonquin and Huron tribes trading in furs from the West and the North. The hydrography of the area no longer held any secrets for the Indians and they had been quick to find a passage to the West, thus making the Ottawa the great fur-trading route and the main gateway to the "pays d'en haut."

This passage was located some 300 miles upstream from Montreal, on the upper reaches of the Ottawa at the level of the Mattawa River. As mentioned earlier, it led to Lake Huron by the Mattawa River, Lake Nipissing, and the French River. Apart from being a more direct way, this passage to the West was preferred by the Indians, and later the French, to the St. Lawrence route because of the proximity of the latter to the territory of the Iroquois, who were hostile to the Hurons and the

Algonquins. Unlike the St. Lawrence, moreover, the Ottawa River offered the fragile canoes used at the time much safer shelter in case of storms.

Their discovery enabled the Hurons and the Algonquins to become the first middlemen between the French fur traders on the river and the nomadic tribes scattered through the North and near the Great Lakes. "On his voyage in 1603, Champlain found that the Hurons from the shores of the Lakes and the Algonquins were coming down the Ottawa to trade in furs on the lower river." [Translation.][17] The Iroquois, however, were not to remain indifferent to the commercial popularity of the Ottawa River. Equally attracted by the fur trade, they began seizing the convoys by following the Rideau River, which empties into the Ottawa. For much of the 17th century an intermittent state of war for control of the fur trade prevailed among the Indians on the Ottawa River, resulting in, among other things, the disappearance of the Hurons and the Algonquins. The former were virtually wiped out by the Iroquois in 1649, and the latter were driven back toward the French posts at Trois-Rivières and Quebec City.[18] Their role as middlemen was taken over in the second half of the century by the Ottawas, who were replaced in turn by the French themselves.

The French lost little time in establishing their claim to the lucrative Ottawa River route. Taking advantage of their friendly relations with the Hurons and Algonquins, they began early in the 17th century to explore the fur territory surrounding the Ottawa River and the Great Lakes. In 1610 Etienne Brulé, the first explorer of the Ottawa River, reached Georgian Bay by way of the Mattawa, Lake Nipissing, and the French River. He was followed during the winter of 1611-12 by Nicolas Vigneau, and in 1613 by Champlain. Champlain's first journey took him only as far as Allumette Island, and it was not until his second trip in 1615 that he was able to trace the much talked-of passage to the West. In his footsteps came many other explorers and missionaries, with the result that by 1625 regular trade relations had been established between the Georgian Bay Hurons and the French on the St. Lawrence.[19] At a time when the beaver pelt served to some extent as currency among the various Indian tribes and furs headed the list of exports to Europe, the popularity of such a passage was no longer surprising.

The French presence in Algonquin and Huron territory was not sufficient, however, to dislodge the Iroquois from the Ottawa Valley, as the massacre of Dollard in 1660 so eloquently demonstrated. After the destruction of Huronia in 1649, the French gradually abandoned the use of Indian intermediaries and traded directly with the tribes of the West and the North.[20] The era of the voyageurs was dawning in the Ottawa Valley, an era that would last throughout the 18th century. The term "voyageur" was applied to all those who had obtained trade licences from the government authorizing them to engage in the fur trade along the Ottawa River, where settlement was at that time prohibited.[21] The voyageurs were regarded as employees of the fur companies which paid them for transporting the goods they brought back from the trading posts; they were also expected to carry various supplies for the trading posts on their way up the river. These posts, which were quite numerous along the Ottawa River under the French regime, were sometimes

referred to as forts, though they were merely small, stockaded trading depots.[22] Going upstream, they were to be found at Carillon and Long Sault, near Grenville (the Petite-Nation post), and at La Lièvre, Coulonge, Des Joachims, Fort Du Moine, and Mattawa. Most of them were strategically located, from a trading point of view, near the tributaries of the Ottawa. The post housed the official in charge, who acted to some extent as a clerk and was responsible for exchanging goods of European manufacture for the furs brought to him by the Indians. It also served as a stopover or shelter for travellers. "These hospitable stopping places in the woods offered shelter from hostile tribes, a place to wait for good weather, a warm, dry bed for the night, or simply a drink or a good meal." [Translation.][23]

Most of the posts were abandoned at the end of the French regime, and by the 1820s furs had ceased to be the main export commodity carried on the Ottawa River. With the amalgamation of the North West Company and the Hudson's Bay Company in 1821, large quantities of furs were diverted to new storage depots located around Hudson's Bay. As a result of the continental blockade, moreover, the Ottawa River area took on a new economic role, becoming a focus for the lumber industry.

Commercial Navigation and Craft Used

Cut off from her former sources of supply by Napoleon's continental blockade in 1806, England had no alternative but to stimulate the export of timber from the colonies to maintain her fleet. Between 1809 and 1810 new laws were introduced, abolishing all customs duties on such imports.[24] Lumbermen and pioneers needed no further encouragement to settle in the Ottawa Valley, and they came in large numbers to take advantage of the employment offered in the lumber camps and the prime market for agricultural products created by the lumber industry.

Commercial navigation on the Ottawa was also to benefit from this new activity. To do so, however, it had to be able to meet the transportation needs of the new enterprises as the simple birchbark canoe was obviously unequal to the task of carrying supplies for the numerous lumber camps. I will attempt here to describe the technological development of the boats used on the Ottawa and the supply route they followed before the canal system was opened in 1834.

Between 1800 and 1820, before the first steamers appeared on the Ottawa, goods were shipped from Lachine on "batteaux" and later on Durham boats.[25] These craft were particularly adaptable to the difficulties involved in Ottawa River navigation. They could be rowed, pushed along with poles, or propelled by sail in the more open sections of the river. They could be hauled through rapids with cables, a method in common use at the Vaudreuil rapids. "Early in the nineteenth century, a capstan had been installed on a jetty built a little way out from the bank, on the mainland side, and this was used to haul the boats through the current, beyond which they would reach the calm waters of the Lake of Two Mountains." [Translation.][26] Although considerably smaller than

the Durham boat, the batteau had a remarkable load capacity compared with an ordinary canoe. It was tapered at both ends and had perpendicular sides rising from a flat bottom which curved upward slightly at each end. It was usually manned by a crew of five, consisting of four oarsmen and a helmsman, and was equipped with square sails, oars, and long poles for use in navigating the rapids. The first batteaux could carry about 3 tons of cargo, or 35 barrels of flour. Larger ones, built later, had a capacity of between 4 and 4.5 tons.[27]

Unfortunately, because trade in supplies in the early 19th century was in the hands of individual companies and statistics are no longer available, the extent to which the two types of batteaux were used on the Ottawa River cannot be determined. For this reason it may be useful to add some details to the description of the batteau to indicate the differences between the two types.

The batteaux on the Ottawa River could, in fact, be up to 75 feet long and 10-12 feet wide, with a hold 5 feet deep. The largest had a 12-foot deck at the stern and a covering of planking around the sides; battens, similar to those found on the Durham boat, were evenly spaced around the sides to serve as supports for pushing the batteau with poles. The remainder of the vessel was open for cargo, which usually consisted of barrels of flour stowed about three rows deep and rising above the height of the deck. The smaller batteaux were open from end to end and were equipped with a wide balanced lug sail and a small stove.[28] These were manned for the most part by Indians.

In terms of navigation and load capacity, therefore, the small-tonnage and the larger batteaux represented a remarkable advance over the canoe. The spectacular growth of the lumber industry between 1815 and 1830, however, necessitated increasingly large shipments of supplies. The Durham boat, with a capacity 10 times greater than the small-tonnage batteau, met the need. "The Durham boat was a flat-bottomed barge, with a keel and centre-board. It was eighty to ninety feet in length, with a nine to ten foot beam, rounded at the bow, and had a cargo capacity ten times that of a bateau."[29] With its rounded bow, the Durham boat was designed to carry the maximum quantity of cargo in a minimum of space (Fig. 3). This compromise, however, made little allowance for the comfort of the crew.

The small stove on which the cooking was done was located in an open area on the main deck, wherever a space could be found. Bunk space was equally limited: the men slept on the foredeck when it was not too heavily loaded; otherwise they bedded down under tarpaulins wherever they could find room. Only the coxswain had a small space at the stern, described as a cabin.[30]

Thus sparsely fitted out, the Durham boat bore little resemblance to a passenger vessel, although according to one of the most reliable sources on Ottawa River navigation it also provided this service: "Captain C.J. Lighthall — who had been captain of one of Judge McDonnell's Durham boats that were employed carrying freight and passengers between Montreal and Pointe Fortune."[31] The Durham's main drawback, however, was its slowness and lack of manoeuvrability. At the foot of the Long Sault rapids, for example, it had to be completely unloaded and pushed forward with poles into calmer waters. Depending on the water

3 Typical Durham boat with cargo. (Public Archives Canada.)

level it took between 24 and 48 hours to cover the 12 miles obstructed by these rapids.[32] Meanwhile the cargo would have been unloaded at Carillon and portaged the full length of the rapids to Grenville.[33] It would then be reloaded and the vessel would continue on its way up the Ottawa. There is little information available on the precise destination of these supplies, but a glance at the route taken by the first steamers would suggest that they must also have been destined for Hull, for eventual distribution to the lumber camps. The Durham boats plied the river regularly in the opposite direction as well. In 1819, in fact, Philemon Wright organized a regular service between Hull and Grenville with the *Packet*; unfortunately there are have no details of its schedule.[34]

All things considered, the Durham boat's only advantage over the batteau was its load capacity as both seemed equally slow and designed exclusively for freight transport. The steamboat was thus to revolutionize the history of navigation on the Ottawa River by eliminating excessive delays and offering passengers a standard of comfort they had previously been denied.

It is to Philemon Wright, the founder of Hull, that credit is due for the introduction in 1820 of the first steamboat on the Ottawa River, the *Union of the Ottawa*. Owned by merchants in Montreal and Hawkesbury, the *Union* was immediately placed in service between Hull and Grenville, making the return trip once a week during its first year of operation.[35]

According to H.R. Morgan, the *Union* was a comparatively modest forerunner of its successors on the waterway, but once again the new vessel represented an astonishing increase in carrying capacity over the Durham boat.[36] It is described by Bouchette as "measuring 125 feet on the deck, by 25 feet beam, drawing but little water, carrying 150 tons, and propelled by a 28 horse power engine."[37] The fares charged on the *Union*, moreover, were considered quite reasonable for the time:

> Whether we consider the infancy of this concern or the cheapness of price, the accomodation [sic] and the fare are as good as can reasonably be expected. For cabin passengers the fare — between Hull and Grenville — is twenty shillings; deck passengers, five shillings; goods and merchandise 23s. 4d. (Time required for the sixty-mile trip was 24 hours.)[38]

The *Union of the Ottawa* plied only the upper section of the supply route, between Grenville and Hull. It was not until 7 years later, between 1826 and 1827, that steamer service was extended over the entire circuit with the arrival of the *William King* and the *St. Andrew's*. In the highwater season they linked Lachine, St. Andrew's, and Carillon, but when the water was low they were forced by the St. Anne's rapids to divide the task: the *St. Andrew's* sailed between Lachine and St. Anne's, and the *William King* provided service between St. Anne's and Carillon.[39] Finally, in 1828 the *Shannon*, a powerful steamer built at Hawkesbury, joined the *Union of the Ottawa* on the Grenville-Hull section of the route.[40]

In summary, steam navigation remained comparatively limited on the Ottawa River before the canals were built. Nine years after the appearance of the *Union of the Ottawa* there were still only two steamboats in use on the upper section of the river, and the situation was little better between Lachine and Carillon. The explanation of this, however, was simple: a private company, the St. Andrew's Steam Forwarding Company, exercised a monopoly over practically the entire navigation circuit by refusing rival operators access to its lock at the Vaudreuil rapids.[41] Fortunately, the Durham boat came into common use in the 1820s and a regular line was inaugurated about 1824 or 1825 between Lachine and Carillon, supplementing the steamer service.[42]

CANALIZATION OF THE OTTAWA RIVER, 1816-43

Background

The American Revolution and the War of 1812 marked important stages in the history of canal building in Canada. As a result of the first conflict an influx of loyalist immigrants from the English colonies, and even from the United Kingdom, sought refuge in the Maritimes, the Eastern Townships, and particularly around Lake Ontario. The British authorities were faced with the necessity of improving communications between the provinces of Upper and Lower Canada to serve the commercial needs of newly settled farms and developing communities.[1] Although connected with Lake Huron, the old fur-trading route did not provide a sufficiently direct link, for purposes of trade, between the new settlements in the West and the commercial centres in the East. In the absence of a road system canalization of the St. Lawrence became the only logical solution to the communications problem, but such a project necessitated the agreement of the two provinces. Their lack of co-operation delayed the undertaking until the early 1840s.

Events were gaining momentum, however, and the War of 1812 pointed up the need for a canal system by demonstrating once again the inefficiency of existing communications between the two provinces:

> The difficulties which had been experimented [sic] in supplying British forces in Upper Canada and the British fleets on Lakes Ontario and Erie during the War of 1812 had indeed convinced the British colonial authorities that something would have to be done to improve transport facilities between the lower Lakes and the sea.[2]

Notwithstanding the failure of the American invasion on the St. Lawrence, the repeated attacks along this artery illustrated the extreme vulnerability of communications between the two main military posts of Upper and Lower Canada, Kingston and Montreal. Because the St. Lawrence was the only supply route for these centres, the possibility of a second attack along the waterway made the canalization of an alternate route, the Ottawa River, essential to security.

These military considerations were very much at variance with the preference of commercial interests, which favoured improvement of the St. Lawrence waterway. National security was judged to have priority, however, and the Imperial government decided to construct a canal system between Montreal and Kingston by way of Ottawa. Although the system involved the construction of the Lachine and Rideau canals, this study will be limited to those on the Ottawa River.

Discussions on Scale of Navigation

The scale of navigation of a canal is closely related to the dimensions (length, width, and depth) of the locks constructed along its

length. Administrators and military engineers were far from unanimous in their views on the scale of navigation to be adopted for the future communications system. Some, including Major-General Sir James Carmichael Smyth, vigorously defended the original concept which provided for a scale adequate for the transport of troops and military matériel. Others, such as Lieutenant-Colonel By, argued that commercial interests should also be taken into account and the scale enlarged accordingly.[3] The military point of view prevailed, and a scale of 108 feet long by 20 feet wide was fixed for the Lachine Canal, as well as for three of the seven locks in the Grenville Canal. After 1828 all other locks in the system were built on the scale of the Rideau Canal, which was 134 feet by 33 feet.[4]

The lack of planning was to cause serious difficulties for steam navigation on the Ottawa River. Because of the narrowness of the three upper locks on the Grenville Canal, only boats not exceeding 20 feet in width could navigate the Ottawa River canal system and the Rideau Canal.[5] From a purely military point of view the objectives were achieved; the disparity in the dimensions of the Ottawa River canals, however, would affect commercial navigation for many years to come.

What were the arguments advanced by the opposing sides with respect to the scale of navigation? In a despatch to General Mann, inspector general of fortifications, Colonel By openly expressed his disagreement with the choice of a scale that made no allowance for the commercial growth of Canada: "I therefore feel it my duty to observe, that all the canals at present projected, are on too confined a scale for the increasing trade of Canada."[6] By went on to propose a new scale that would serve both military and commercial interests:

> and for military service they ought to be constructed of sufficient size to pass the steam boats best adapted for navigating the Lakes and rivers of America, which Boats measure from 110 to 130 feet in length, and from 40 to 50 feet in width, drawing 8 feet of water when loaded, and are capable of being turned to military purposes without any expense, as each boat would carry four 12 P:[ns] and 700 men with great ease.[7]

Not surprisingly, Smyth vigorously opposed By's proposals. In a letter to General Mann,[8] Smyth reminded him that the main purpose of this vast communications project was to be able to move troops and matériel between Upper and Lower Canada without risk of capture on the St. Lawrence. With complete disregard for the commercial aspects, Smyth opposed the scale of navigation By had proposed, considering a scale of 108 feet by 20 feet fully adequate for military requirements. He even went so far as to question the economic feasibility of a larger scale:

> I do not see any benefit to be derived from a greater breadth without a corresponding depth. Locks of 20 feet in breadth will afford every advantage; a large Canal will never pay, will cost a prodigious sum and will not afford corresponding advantages.[9]

Similar differences of opinion were being expressed by the military administrators, and in 1828 they set up a committee to resolve the question of the scale of navigation.[10] The committee was made up of Lieutenant-General James Kempt and two members of the Royal Engineers, Lieutenant-Colonels Fanshawe and Lewis.[11] After a thorough examination of the route of the Rideau Canal, the committee issued instructions to Lieutenant-Colonel By (responsible for the work on the Rideau Canal) as to the dimensions that would apply to the locks of that canal and to all other locks in the Ottawa River system: "The locks are to be capable of containing a steam boat 30 feet wide over the paddle Boxes and 108 ft long clear of opening the Gates."[12]

These instructions gave By some latitude in that they limited the length of the lock chamber between the gates to 108 feet, but not the overall length of the lock. In a last effort to gain acceptance of his option, By submitted to the committee a comparative estimate of the costs of construction of the Rideau Canal on the basis of the different scales proposed:

For the Lachine Lock of 20 feet wide by 108 feet long	£544,676.2.9-1/2
The Lock of 150 feet long by 50 wide with the sluices in the gates as proposed by Lt. Colonel By	£597,676.2.9-1/2
The lock of 134 feet long by 33 feet wide approved by the Committee	£576,757.14.9-1/2[13]

In the end the committee did not accept any of the conflicting proposals; on 5 July 1828 the dimensions of the locks in the Ottawa River military canal system were fixed at a length of 134 feet, a width of 33 feet, and a depth of 5 feet of water over the sills.[14]

One important comment should be made before moving on to the construction period of the Ottawa River military canals. The official records of the construction of the Carillon, Chute-à-Blondeau, and Grenville canals were destroyed in a fire in 1852 at the offices of the Royal Engineers in Montreal.[15] The loss of these documents is naturally a serious handicap in making a structural study of the three canals as no original contracts, plans, or specifications relating to the construction period now exist. However, with the aid of some of the correspondence exchanged among the British Treasury, the Secretary of State for the Colonies, and officers of the Royal Engineers, which was retranscribed in the *British Parliamentary Papers*, I have been able to reconstruct a fairly complete account of the building of the canals. The *General Report of the Commissioner of Public Works, 1867*, moreover, provides a detailed description of the structures comprising the canal system at that time. By a comparative study of these two sources I have arrived at some hypotheses with respect to the construction period and the original dimensions of the canals.

Construction of the Carillon Canal

In October 1818 Captain J.W. Mann of the Royal Engineers carried out a survey of the Ottawa River to locate the obstacles that would have to be overcome to allow the passage of gunboats up the waterway. In his report Captain Mann recommended, among other things, that canals be constructed at the Carillon, Chute-à-Blondeau, and Long Sault rapids.[16] As a result of this survey an initial plan for the Carillon Canal was drawn up in 1819.[17]

As no information could be obtained about this first plan it is assumed that it was one of the documents destroyed in the 1852 fire. It would certainly have had to follow the scale of navigation proposed for the Lachine Canal, however, which was based on locks 108 feet long and 20 feet wide.[18] It would seem that nothing came of the first plan as in 1829 the work of clearing the site of the Carillon Canal was still in progress.[19] In that year Lieutenant-Colonel Henry Du Vernet submitted an estimate of £58,068.8.6-1/4 for the construction of the canal.[20] The estimate included the building of two locks, each with a chamber 23 feet wide and 110 feet long. The canal was to be 2 miles long, and much of it would have to be cut through rock. Du Vernet estimated that the project would extend over three seasons as the workmen were already engaged on other public works undertakings.[21] In the meantime, a revised estimate totalling £88,633.5.2 1/2 was submitted to Lieutenant-General Sir James Kempt for the construction of the Carillon Canal.[22] In view of the enormous difference of £30,564.16.8 between the two estimates, Kempt delayed the start of the work and appointed a committee under Colonel Durnford to look into the increase and submit a more realistic estimate.[23] The committee submitted its report on 6 March 1830 with a new estimate of £72,318.3.7 for the building of the Carillon Canal.[24] Two days later the chairman of the committee informed Lieutenant-Colonel Cooper that the new estimate might be considerably reduced by cutting down as much as possible on the cost of excavation, which gave promise of being extremely laborious. Instead of cutting through the rock, Durnford proposed that the canal be "perched" on an elevation above the Ottawa River and fed from the waters of a nearby tributary, the North River; the proposal seemed feasible as the North River was some 6 feet higher than the site proposed for the Carillon Canal.[25]

On 16 May 1830 Du Vernet accordingly submitted a report and an estimate of the cost of constructing a canal at Carillon,[26] to be fed by the waters of the North River (Appendix A). In the absence of any original contract or specifications, this document seems to be a fairly accurate description of the work that was carried out during the 1830s as the locations of many of the structures to which it refers correspond perfectly to those described in the *General Report of the Commissioner of Public Works, 1867*.[27]

The Carillon Canal was located 42 miles upstream from the Lachine Canal, on the north side of the Ottawa River. Its ancillary structures included two dams 150 and 200 feet, respectively, in length and 9 feet high, by which water from the North River was to be diverted into a channel or feeder canal 1150 yards long. The feeder canal was 12

4 Location of site proposed by Lieutenant-Colonel H. Du Vernet for construction of Carillon military canal, 29 May 1830. The drawing shows the position of the feeder canal and the two small stone dams erected on the North River. (Public Archives of Canada.)

feet wide at its base and 4 feet deep, with 45-degree banks (Fig. 4); the mechanism regulating the flow was located close to its junction with the Carillon Canal. Du Vernet's report unfortunately contains only this brief reference to the location of the regulatory mechanism of the feeder canal. Although the original plan cannot be found the importance of this structure makes it worthwhile to describe it as it appeared in 1867.

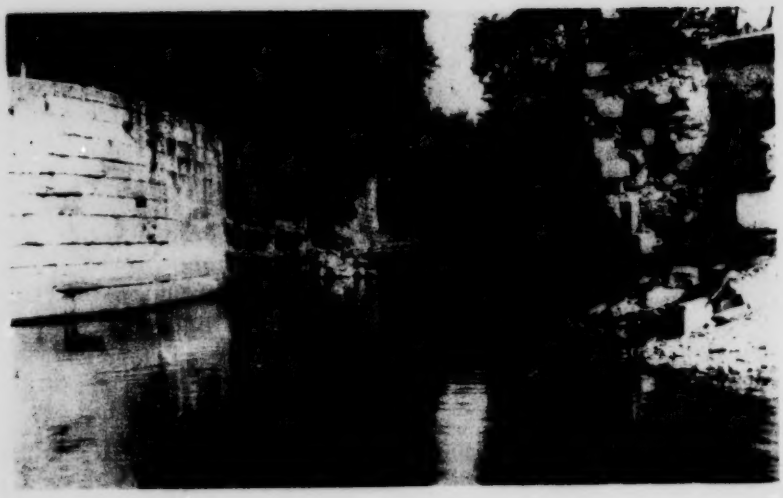
> The weir for regulating the water is situated 500 feet from the canal, and is built with side walls of cut stone masonry, resting on a timber foundation. The water is drawn through three sluice-ways of 4 feet, 3 inches by 3 feet, 5 inches, formed in a breastwork of timber placed between the walls of the weir. The sluices are worked by rack and pinion gearing.[28]

The canal itself had three locks over its 2.09-mile length, two at the downstream entrance and the third at the upstream end. According to a report by Captain Warden, who had been commissioned to carry out a study of navigation in Canada in 1846, the Carillon locks were 128 feet long and 33 feet wide and had a depth of 5 feet of water over the sills.[29] Du Vernet's estimate provided also for the construction of a sluice and two lockmaster's houses, but the latter were apparently not built until 1843.[30]

Although the officers of the Royal Engineers retained responsibility for the direction of the canal project, a contract for the work involved was awarded to Messrs. McKay and Creighton on 2 September 1830.[31] The project was scheduled for completion by 31 October 1831,[32] but the work was delayed by unusually high water levels on the Ottawa River and by an epidemic of cholera, and the canal was not completed until 1833.[33] It was officially opened on 24 April 1834 when the steamer *St. Andrew's* and two barges belonging to the firm of McPherson and Crane went through the locks.[34] Of the three locks that formed the Carillon military canal, only the lower one has been preserved (Fig. 5). At the request of the Argenteuil County Historical Society extensive restoration work was carried out by the Department of Transport in the early 1960s.[35] As many of the original stones had to be replaced, however, the present site is not an integral restoration. The fact that a considerable number of the replacement stones came from the lock chambers of the old Grenville Canal, moreover, explains a serious error that occurred when the work of reconstruction was being carried out: although it has just been stated that the Carillon Canal was completed in 1833, the commemorative stone in the lower lock of the canal bears the inscription "No III Royal Staff Corps 1827." This is obviously one of the stones taken from the locks of the old Grenville Canal before it was flooded in 1963.

In addition to the lower lock, two other fragments remain to remind us of the historic past of the Carillon military canal: a section of the feeder canal and the ruins of one of the dams built on the North River (Fig. 6). Interpretation of these remnants, however, involves serious difficulties in that both are located on lots belonging to the provincial government.

Of the administrative and residential buildings associated with the



5 Remnants of lock No. 1 of old Carillon military canal in 1914. At the request of the Argenteuil County Historical Society, extensive restoration was done between 1966 and 1967.

historic development of the Carillon Canal, only the residence of the superintendent and the collector's house have been preserved. Although the origin of the superintendent's house appears somewhat uncertain, there are reliable indications that the building now known as the collector's house (Fig. 7) was built between 11 April 1842 and 30 June 1843 from plans drawn up by British military personnel serving with the Royal Engineers.

In the first place, the *General Report of the Commissioner of Public Works, 1867* contains a general description of each of the buildings on the site of the Carillon Canal in that year. From that report have been extracted the descriptions of only two buildings because their locations correspond in all respects to the present sites of the residences of the superintendent and the collector:

> The Superintendent's house is situated between Lock No. 1 and the road. It is built of stone, two stories high, 33 feet 9 inches in length by 20 feet 8 inches in width; with a framed one-story wing 19 feet 3 inches by 19 feet 2 inches, with framed outbuilding, 34 by 15 feet.
>
> The Collector's and Superintendent's office are on the point between Lock No. 2 and river, built of stone covered with tin, one story high, 26 feet 10 inches by 25 feet 8 inches, with two porches, 8 feet 5 inches by 7 feet 2 inches.
>
> The lock laborers are furnished with sleeping apartments in the rear portion of the Collector's Office.[36]

6 Section of feeder canal at beginning of 20th century. Today much of the channel is covered with thick vegetation, but it is still visible near its junction with the North River. (Courtesy Argenteuil County Historical Society.)

Although this description makes no mention of the origin of the buildings, it is interesting to note that the collector's house served several functions in 1867, including that of an office for the collector and the superintendent. The *Annual Report of the Department of Railways and Canals, 1887* states "a building originally erected as an office by the Ordnance has been converted into a suitable dwelling house for the canal collector here, an accomodation [sic] that was much needed. It is now on the eve of completion."[37] This report says that the collector's house had been built under the Ordnance (i.e. under the direction of the Royal Engineers) and was used originally as an office.

From this a close link between the collector's house and the construction of two buildings by the Ordnance between 11 April 1842 and 30 June 1843 can be established.[38] One of these was to serve as an office for the engineers and a house for the lockmaster, and the other as an office and storage area (or warehouse) for the Ordnance.[39] Summing up the various functions served by the collector's house from the time it was built:

1843: office and storage area for the Ordnance (the storeman also acted as collector);

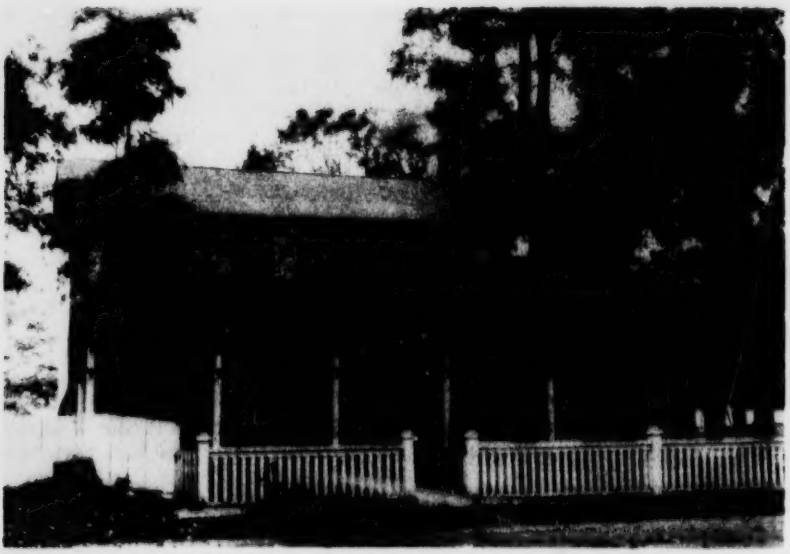
1867: office shared by the collector and the superintendent, with sleeping quarters for the lock labourers in the rear portion of the collector's office;

1877: a house for the collector (who must also have worked there as the purpose of the alterations was to bring him closer to his work).

It was not after until 1901 that alterations were made to the upper storey of the building: "Mackay, the Collector of Canal Revenue at Carillon ... asks for an alteration in upper story of the Government house he occupies at Carillon, by the removal of a partition. This is approved of and you may instruct Foreman Gerard accordingly."[40]

With regard to the superintendent's residence (Fig. 8), although conclusive evidence that it was one of the two buildings constructed between 11 April 1842 and 30 June 1843 is lacking, this date at present appears the most likely. In a letter to the Secretary of Public Works in 1877, the superintending engineer of the canals informed him that "the

7 Collector's house at Carillon as it appeared in 1927. This building, erected between 1842 and 1843, served originally as an office and store for the Ordnance.



8 Residence of superintendent of Carillon and Grenville canals in 1929. This building was probably constructed in the early 1840s, but was not fitted out as a residence for the superintendent until 1857. It is one of the best-preserved structures remaining from the time of the first Carillon Canal.

house referred to was specially fitted up for lodgings for the Superintendent of these Canals, soon after they were placed under the management of the Public Works Department."[41] The building now known as the superintendent's residence thus existed prior to 1857 (date of the transfer of the Ottawa River military canals to the Department of Public Works), but was being used for other purposes as it was only after 1857 that it was converted to living quarters for the superintendent. A plan dating from 1844, moreover, shows a building on the present site of the superintendent's residence.[42] It is quite possible that this structure was erected at the same time as the collector's house as two buildings were constructed by the Ordnance between 11 April 1842 and 30 June 1843. This being the case, the superintendent's house would have served originally as an office for the engineers and a house for the lockmaster.

Construction of the Grenville Canal

The Grenville Canal, also located on the north side of the Ottawa River, formed the upper section of the military canal system. Accounts

by Messrs. Owens, Williamson, and Pridham, three residents of Grenville in the 1820s, indicate that construction of the canal system began with the Grenville Canal in 1819.[43] Their statements are confirmed in a report by Captain Henry Du Vernet, dated 18 December 1820,[44] in which he described the excavation work as completed on a 2700-yard section at Grenville, but added that considerable delay seemed inevitable.

Only 2 or 3 feet down the workmen had struck very hard rock, covering much, if not all, of the projected length of the Grenville Canal.[45] A similar difficulty had been the cause of the late start of construction at the Carillon and Chute-à-Blondeau canals. In addition to the drilling problem the annual appropriations voted for the work were limited to £8000.[46] Progress was therefore very slow at Grenville. Three of the seven locks were constructed before 1828, on the reduced scale of the Lachine Canal, whereas the other four adopted the scale of the Rideau Canal. The Grenville Canal was finally completed in 1829.[47]

Although representations were being made as early as 1830[48] to have the three small locks on the canal enlarged, it was not until the early 1870s that any reconstruction was undertaken.[49]

Construction of the Chute-à-Blondeau Canal

Four miles upstream from the upper end of the Carillon Canal, on the north side of the river, the Chute-à-Blondeau Canal formed the middle link of the military canal system. An initial plan for this canal had been drawn up in 1819 by officers of the Royal Engineers, but construction did not begin until 12 February 1829.[50] At that time the military engineer Henry Du Vernet was still grappling with the difficulties involved in the excavation for the Grenville Canal, on which work had been in progress since 1819. He accordingly suggested that the Chute-à-Blondeau Canal be constructed by contract, under the supervision of officers of the Royal Engineers.[51]

The contract was awarded to a man by the name of Cook,[52] probably between 1829 and 1830. The work was completed in May 1834,[53] having been considerably delayed by a cholera epidemic in the area late in the summer of 1832.[54] Although no plan showing the construction of the canal now exists, its approximate dimensions can be deduced from available information. Because it was built after 1828, it would have had to follow the scale of the Rideau Canal to meet the requirements of the canal committee.[55] It seems quite probable, therefore, that the Chute-à-Blondeau Canal was built according to specifications drawn up by Du Vernet on 29 January 1829, as these complied in every respect with the committee's requirements. "The Locks 33 feet wide, 110 feet long, clear of the gates; lift, four feet; walls of the Locks 26 feet above the lower sill. The canal 33 feet wide at the bottom; slopes equal to one-fourth of the height; length, including the Lock, 700 feet; to carry five feet of water."[56] The canal structures were flooded when the Hydro-Quebec dam was built at Carillon between 1960 and 1963.

The Vaudreuil and St. Anne's Locks

The locks at Vaudreuil and St. Anne's, though located on the same route as the Carillon, Chute-à-Blondeau, and Grenville canals, were not part of the Ottawa River military canal system. Because of their importance in relation to the commercial use of these canals, however, they should be included in this study.

It would seem that gunboats could quite easily have navigated the rapids at this location as the difference in level overcome by the locks was only 3 feet. This is borne out in a report by Mann,[57] who was instructed to conduct a study of the Ottawa River waterway and who saw no need to build a canal at the St. Anne's or Vaudreuil rapids to allow passage of this type of craft. The fact that locks were built at Vaudreuil and St. Anne's, therefore, can only be attributed to purely commercial interests.

From various information gathered, the Vaudreuil lock appears to have been built between 1815 and 1816 by the St. Andrew's Steam Forwarding Company.[58] Cyrus Thomas, however, attributes its construction to Theodore David, a prominent St. Andrew's businessman.[59] Was there a connection between Davis and the St. Andrew's Steam Forwarding Company? Though not spelled out, this is suggested in certain passages of Thomas's history: "when steamboats began running to Carillon, they found great difficulty in getting up the rapids at St. Anne's, and to overcome this difficulty, Mr. Davis constructed locks at Vaudreuil, which were in use for several years."[60]

The lock was built, in any event, in the Vaudreuil channel between the mainland and Ile Perrot, where the Lake of Two Mountains joins Lake St. Louis.[61] Information is sketchy with regard to its composition and dimensions; it was a wooden structure, designed for the passage of only 20-horsepower boats. It was subsequently turned over to the Ottawa Forwarding Company (later the Ottawa and Rideau Forwarding Company), which rebuilt it of wood between 1832 and 1833 on the scale of the Grenville Canal.[62] By imposing excessive charges for the use of their lock by rival concerns, the Ottawa Forwarding Company succeeded in establishing a commercial monopoly on the Ottawa River canal system, which even extended to the Rideau Canal.[63] Other navigation companies were obliged to resort to the old practice of ascending the channel with the aid of a winch mounted on a jetty located above the Vaudreuil rapids.[64] The monopoly at the lock continued until 1841, when R.W. Shepherd, operating for a rival company, discovered a channel through the St. Anne's rapids that could be navigated under steam.[65]

The lock at Vaudreuil was finally replaced by the St. Anne's lock in 1843. Although it was still visible in 1896,[66] archaeological excavation would now be the only means of locating the exact site of the Vaudreuil lock, which was in fact the first commercial lock on the Ottawa River.

The monopoly exercised at the Vaudreuil lock provoked vigorous reaction among merchants in both Upper and Lower Canada. A number of petitions were addressed to the Legislature of Lower Canada, protesting against the injustice of such a monopoly and demanding that it be redressed by the construction of a lock at St. Anne's. In one of these

submissions the petitioners urged that building a lock at St. Anne's would greatly improve the route:

> Your Memorialists beg leave to call your Excellency's attention to this important fact, that the route by which the said Company's boats are obliged to go, is from thirteen to fifteen miles longer than the one contemplated and surveyed by the Government Engineers, which is nearly a straight line and of greater depth of water than the one in use.[67]

Compelling though the arguments were, the petitions were unavailing until support came from the Legislature of Upper Canada.[68] This body, irritated by the continuing monopoly being enjoyed by the Ottawa Forwarding Company and its effect on the Rideau Canal, forced the governor to intervene in the construction of the St. Anne's lock. The contract to build it was signed on 18 May 1840, and work was completed in 1843.[69] As its name indicates, the lock was located opposite the village of St. Anne's and formed the downstream entrance to the Ottawa River canal system. It was built by Captain Stekelin under the direction of the Board of Works of the Province of Lower Canada.[70]

Designed exclusively for commercial use, the St. Anne's lock was constructed on a considerably larger scale than the Rideau Canal and the other Ottawa River canals.

> This lock is situated in the river, near the north shore, at the foot of the rapid of Ste. Anne, with a lift of 3 feet in low water, which overcomes the fall. It is built of cut stone masonry, on a foundation of timber and plank, resting on seamy, rotten sandstone, and is 190 feet in length between quoins, and 45 feet in width, with the usual wing walls.[71]

This was the final stage in the construction of the Ottawa River canal system between 1816 and 1843. Two important aspects of the system during this period should be borne in mind. The first is the complexity of its administration, which stemmed from the fact that its various components were governed by different jurisdictions: the Vaudreuil lock was controlled by private enterprise, the St. Anne's lock by the government of the Province of Lower Canada, and the Carillon, Chute-à-Blondeau, and Grenville military canals by the Imperial government in London. Second the objectives envisaged in the construction of the canal system were almost as varied as its components. The Vaudreuil lock was intended to serve the interests of one navigation company whereas the St. Anne's lock was built to facilitate trade between the provinces of Upper and Lower Canada; the Carillon, Chute-à-Blondeau, and Grenville canals were constructed for purely military purposes.

In practice the system proved incapable of accommodating such widely divergent interests. By eliminating the Vaudreuil lock in 1843, the merchants succeeded in making the Ottawa River canal system accessible to all competitors. The petitions they submitted for construction of a lock at St. Anne's are a valuable source of information on

the use of the waterway in the 1830s; from them can be seen how the military function of part of the system was overtaken by its commercial role during the first years of operation.

> The Petition of the undersigned Merchants, Traders and other Inhabitants of the City of Montreal humbly sheweth;
> That they are truly sensible of the Munificence of the British Government in many respects towards these Colonies, and in nothing more than the construction of the Rideau Canal, work well calculated to develop and mature the great natural advantages of this young and highly favored Country. But the benefits of which great work have been but very partially felt, owing to the want of a Lock at the Ste. Anne Rapids.[72]

The petitioners' strategy is quite clear. The document is designed to indicate that the construction of the Rideau Canal, and by extension the Ottawa River military canal system, is serving only economic interests, and that the absence of a lock at St. Anne's is detrimental to these interests. It is known, however, that these canals were built for an altogether different purpose, namely the defence of the area in the event of attack on the St. Lawrence River. As there was no conflict in progress at the time the petitions were sent and no military manoeuvres had ever been staged on the system, the petitioners succeeded in having the commercial use of the waterway given priority over its military function.

Environmental Impact of the Military Canal System

The construction of the military canals had relatively little impact on the essentially agricultural environment of the north shore of the Ottawa River. In terms of settlement, for example, the reports of land surveyor Joseph Bouchette published in 1815 and 1832, which take in almost the entire construction period of the canal system, indicate that only the township of Grenville experienced a population increase directly attributable to the building of the canals.

> The first settlement of Grenville commenced a few years ago, yet in 1829 the population of the township and its augmentation already amounted to 1858 souls; an increase attributable to the advantages held out to the settler by the labour required on the canal and the readiness with which farms could be obtained on the spot from the commanding officer, acting as resident land-agent for the township.[73]

This increase in population at the western end of the system was not surprising as work on the Grenville Canal, the first to be built, began in 1819 and continued until 1829. Conditions were favourable for settlement in that the neighbouring seigniories were still in their initial

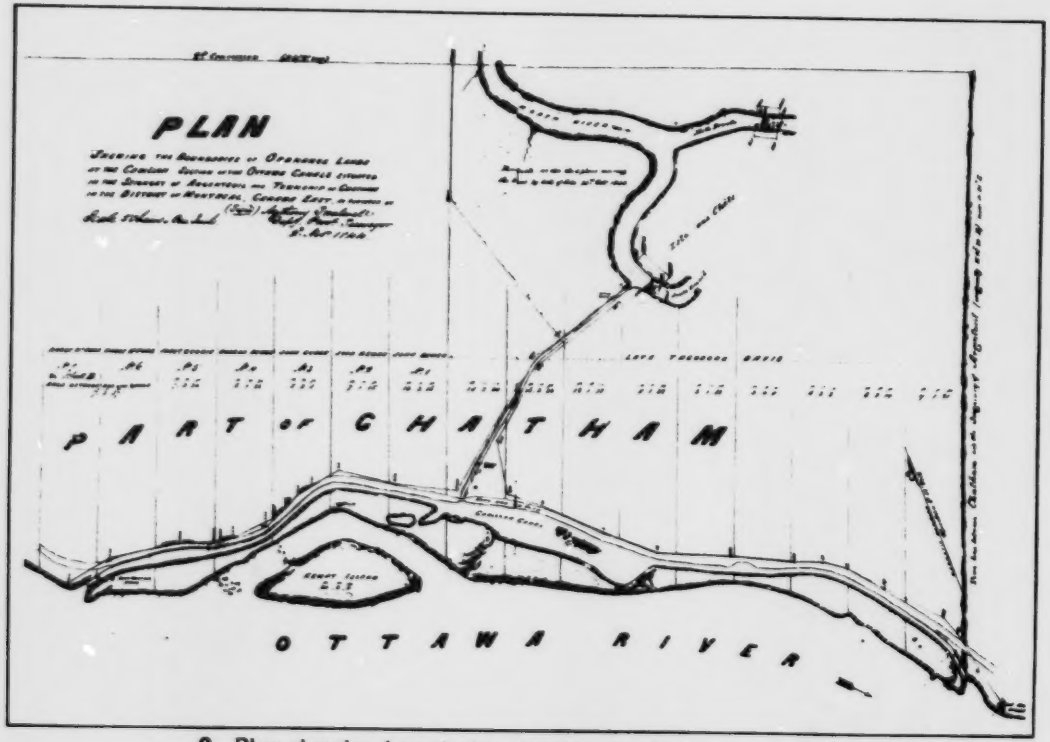
colonization phase and could not in themselves provide sufficient manpower. Many Irish and Scottish immigrants took advantage of the opportunity of work on the canal to settle in Grenville Township.[74] The fact that Bouchette does not record any similar development with respect to Carillon or Chute-à-Blondeau suggests that the construction of these canals must have involved the same group of immigrants that had settled in Grenville.

In summary, the building of the canals had only a minimal effect on the settlement of the area; the two terminals of the system, Carillon and Grenville, have remained quite sparsely populated to this day. Their populations, which in the first census, taken in 1891, were recorded as 255 and 502, respectively, by 1971 had increased to only 420 and 1495.[75]

Nor was the impact of the canal system any greater in terms of its operational staff. The first lists of employees that appeared in 1855 refer to only 20 positions: a superintendent, seven lockmasters, and 12 lock labourers for the 11 locks in the Carillon, Grenville, and Chute-à-Blondeau canals.[76] The employment offered by the operation of the canals, therefore, was of little direct benefit to the local population, particularly as at least five of the seven lockmaster positions were immediately filled by officers of the Royal Engineers[77] when the system opened in 1834. Many of these positions were later passed on from father to son, thus limiting their accessibility to the general public.

Far from being increased with the opening of the second canal system, the operating staff at the Carillon and Grenville locks was reduced by six positions in 1884 and thereafter consisted of only a superintendent and his assistant, seven lockmasters, and five lock labourers.[78] A more detailed account of the responsibilities of each of these positions can be found in *The Work Force of the Richelieu River Canals, 1834-1950* by P.-André Sévigny. In terms of the labour force, therefore, it cannot be claimed that the building of the canals had a significant economic impact on the local population.

The expropriations required for the construction of the canal system were not of great environmental consequence to the farmers concerned, most of whom gave up only a narrow strip of land located between the Ottawa River and the canal channel.[79] Loss of access to the river may, of course, have caused inconvenience to some farms whose owners had allowed their cattle to water along the bank. Where the land bordering the river was marshy or wooded, however, the loss of access meant little. Records indicate that some 20 farmers were affected by these appropriations between the villages of Carillon and Grenville,[80] but unfortunately a map on which they are shown has not been found. Figure 9,[81] however, enables an assessment of the relatively negligible extent of the losses sustained by the proprietors whose land adjoined the Carillon Canal. In this area most of the property expropriated lay at the lower end of the first concession lots, between the Ottawa River and the tow-path that ran along the canal. In all, sixteen lots belonging to five proprietors were involved. Of these, Theodore Davis was the most seriously affected as not only did he lose land along the riverbank, but also the feeder canal cut across four of his lots. In general, however, the expropriations did not change the agricultural character of the land bordering the river.



9 Plan showing boundaries of Ordnance lands at Carillon, 2 November 1844. (Public Archives of Canada.)

Transfer of the Military Canals to the Canadian Government

Having been constructed by the Imperial government for strictly military purposes, the Carillon, Chute-à-Blondeau, and Grenville canals were virtually doomed to failure from a commercial point of view from the time they went into operation in the 1830s. The lack of planning evident in the system as finally completed was one of the main causes of this failure. The three upper locks on the Grenville Canal had been built on the scale of the Lachine Canal whereas the remainder of the system, constructed after 1828, adopted the larger scale of the Rideau Canal. Such a difference of scale within the same canal system had adverse effects on commercial navigation. The development of trade called for the use of increasingly large steamboats, and the upper locks of the Grenville Canal, which could admit only boats built on a smaller scale, stood as an obstacle to commercial expansion. Finally, the improvement of the St. Lawrence route, comprising the canals at Lachine (enlarged in 1848), Beauharnois (1845), Cornwall (1843), and Williamsburg (1847), sealed the fate of the Ottawa River canals as a commercial waterway.

Tables 1 and 2 clearly show the inability of the Ottawa River military canals to withstand the competition presented by the St. Lawrence canals from the time the latter were opened in 1847. Although the statistics contained in Table 1[82] cover only 4 years' operations, certain trends can be discerned. In terms of revenue, for example, the marked decline recorded between 1845 and 1846 can only be explained by the depressed economy of those years as the St. Lawrence canals were not yet in operation.[83] In 1847 revenues reflected a similar drop, however, going from £1378 to £634. Table 1 indicates in this instance that the further decline was attributable both to the opening of the St. Lawrence canals in 1847 and to the repairs required on the canals in the same year.

An analysis of expenditures related to the use of the military canals as shown in this table is equally revealing. Whether the expenditures are for repairs or salaries, they reflect a continuing upward trend between 1845 and 1847. The statement of revenue and expenditure shows a deficit on the order of £698 in 1846, and £3051 in 1847. On the

Table 1. Comparative statement of revenue and expenditure of the Carillon, Grenville, and Chute-à-Blondeau military canals between 1844 and 1847

Year	Revenue	Repairs and maintenance	Salaries: officers, other ranks, and civilians	Total expenditures	Profit	Loss
1844	£ 3830	£ 2943	£ 200	£ 3134	£ 687	—
1845	£ 3380	£ 1676	£ 210	£ 1886	£ 1494	—
1846	£ 1378	£ 1856	£ 220	£ 2076	—	£ 698
1847*	£ 634	£ 3455	£ 230	£ 3685	—	£ 3051

*The military canals were closed for repairs for much of the season; in addition, this year coincided with the opening of the St. Lawrence canals.

Table 2. Comparative statement of revenue and expenditures of the Ottawa River military canals, including the Rideau Canal

Year	Tolls	Rental	Total revenue	Administration costs	Construction and repairs	Total expenditures	Return on operations: deficit
1847-48	£ 3845	£ 943	£ 4788	£ 6797	£ 10 329	£ 17 125	£ 12 337
1848-49	£ 3922	£ 1596	£ 5518	£ 7962	£ 8 836	£ 16 798	£ 11 280
1849-50	£ 2555	£ 1340	£ 3895	£ 8750	£ 7 439	£ 16 189	£ 12 294
1850-11	£ 3351	£ 1900	£ 5251	£ 6805	£ 5 119	£ 11 924	£ 6 673

basis of statistics, therefore, it is clear that the Carillon, Chute-à-Blondeau, and Grenville canals represented an administrative liability for the Imperial government from the time the St. Lawrence canals went into operation. This is borne out by Table 2, which indicates that the military canals remained an administrative burden well beyond 1847.

Care must be taken, however, in interpreting the data presented as Table 2 combines statistics for the Rideau Canal with those for the Ottawa River canals to form overall totals in which, in the absence of relevant documents, the two cannot be differentiated. The reader will understand, therefore, that this table does not lend itself as readily to analysis as did Table 1. Under the heading of revenue, for example, Table 2 indicates an appreciable increase over the preceding 4 years[84] despite the opening of the St. Lawrence canals. Although this increase would seem to disprove what we have been saying, there is in fact a simple explanation: the revenue is inflated to a large extent by the addition of the Rideau Canal statistics. The revenues of the Ottawa River canals would be a great deal more modest if it were possible to isolate them by deducting from the total revenue the tolls collected for the use of the 47 locks on the Rideau Canal as well as the revenue derived from the rental of land adjacent to that canal.

The statistics contained in the statement of commercial activity in Table 2, however, are clear. Although the expenditures that resulted in the deficit were attributable in large measure to the Rideau Canal, the fact remained that the military canals on the Ottawa River were becoming an increasing drain on the Imperial government.

With the opening of the St. Lawrence canals in 1847, activity on the Ottawa River canals was reduced to very local supply traffic,[85] associated for the most part with the lumber trade in the area. It is understandable that commercial traffic as such had no alternative but to take advantage of the shorter and consequently less expensive route leading to the vast Great Lakes market. In addition to these advantages, the St. Lawrence canals offered a much larger scale of navigation than the Ottawa River waterway: the smallest of the Williamsburg locks, on the Iroquois Canal, was 200 feet long and 45 feet wide, with a depth of 6 feet over the gate sills, whereas most of the other locks in the St. Lawrence system provided a depth of 9 feet over the sills. Competition with the new circuit was thus impossible.

Realizing the very limited use being made of the Ottawa River canal system after 1847, the Imperial government proposed on 24 March

1848 that it be transferred to the Canadian government, subject to certain conditions.[86] Maintenance of the system would become the responsibility of the Canadian government, which would name three representatives to serve along with three appointees from the Imperial government as a governing board. After a brief analysis of the situation the provincial secretary informed the officers of the Board of Ordnance on 3 June 1848 that Canada was not in a financial position to accept the transfer.

> H.E. Comds are to acquaint you in [illegible] that in the present state of the finances of the Province, the great Provl. Works being still incomplete and not having yet become remunerative and their cost and maintenance being a heavy burthen on the PL revenue, H.E. is of opinion that it could not be expedient for the Provl. Govt. to undertake the charge of the Military Canals.[87]

Despite this refusal, the Imperial government renewed its proposal on 3 March 1853, undertaking this time to pay the maintenance costs of the canals until 30 September 1857.[88] The Canadian government proved more receptive to the transfer on these terms. By order in council dated 13 May 1853, it accepted responsibility, temporarily, for the maintenance of the military canals effective 1 October 1853.[89] Arrangements for a final transfer proceeded, but the Imperial government, although the initiator of the proposal, was still imposing conditions. Troops and military equipment were to be exempt from the payment of tolls and the Canadian government was to maintain each of the locks in perfect condition.[90] These terms were accepted and the transfer of the Carillon, Chute-à-Blondeau, Grenville, and Rideau canals to the Canadian government was enacted on 19 June 1856 (19 Victoria, Chapter 45).[91]

STRUCTURAL CHANGES TO THE OTTAWA RIVER CANAL SYSTEM, 1867-1963

Deterioration of the System: 1834-70

There were numerous indications that sooner or later major structural alterations would have to be made over the entire Ottawa River canal system. From the time the system opened, for example, a totally unacceptable construction defect limited its usefulness in terms of the commercial requirements of the era. Locks Nos. 1-8 in the system, which included the three locks on the Carillon Canal, the one at Chute-à-Blondeau, and four of the seven on the Grenville Canal, had a minimum length and width of 134 feet by 33 feet, whereas the three upper locks on the Grenville Canal were only 108 feet long by 19 feet wide.[1] These three locks, therefore, to all intents and purposes strangled steam navigation for the 246 miles between Montreal and Kingston, via the Rideau Canal. "Even the smallest Steamers now find a difficulty in passing through the 20 feet wide Locks and the narrow part of the Grenville Canal."[2] Although the problem was decried in the highest business and military circles,[3] nothing was done to enlarge the locks until an extensive reconstruction program was undertaken on the whole canal system between 1871 and 1884.

Nor were navigation problems confined to the Grenville Canal. During his first tour of inspection in 1859, John G. Sippell, the superintending engineer of the canals, found marked signs of wear throughout the system, particularly on the lock gates, most of which had to be repaired.[4] Large cracks had appeared in the chamber wall of lock No. 1 on the Carillon Canal, and the walls of lock No. 10 on the Grenville Canal were in danger of collapsing inward.

Not only was the system showing symptoms of structural deterioration, but also a serious drop in the water level occurred in several sections in the 1860s. At Grenville, for example, the problem became so acute during the low-water season that a major shipping company, the Ottawa and Rideau Forwarding Company, stationed a steamer at the upstream entrance to the canal to force water to lock No. 10. This technique, which had been in use since the 1850s, made it possible to maintain an adequate water level in the canal and obviated the necessity of lightening and reloading the barges as they passed through this section.[5] Although this method was effective, it could not be regarded as a permanent solution to the problem. The Department of Public Works was inundated with petitions from shippers of forest products, timber merchants, and navigators complaining of the inadequacy of the Ottawa River canals for commercial shipping. One of these petitions, endorsed by such prominent lumbermen as Booth, Eddy, and Gilmour, summed up the main proposals put forward to make the entire Ottawa River canal system accessible to vessels drawing 5 feet 6 inches instead of 4 feet 6 inches.[6]

At Grenville they proposed that the canal banks and lock walls be

raised by 1 foot to enable vessels drawing an additional 8-10 inches to use the locks. This improvement would increase the permissible load capacity of the boats by more than 20%. The petitioners also requested that two additional turning basins be constructed on the canal to handle the vastly increased traffic in timber. They asked that the upper entrance to the Chute-à-Blondeau lock be dredged to prevent barges and steamers from running aground, as they frequently did. At Carillon the main problem was an irregular flow of water to the canal from the North River. To overcome this difficulty the petitioners suggested that a permanent dam be built on the North River to divert a maximum volume of water to the feeder canal. They insisted that the feeder canal had to be made considerably deeper and wider. Finally, they requested that large boulders obstructing the downstream entrance to the lock at St. Anne's be removed.

The timber producers and shippers, not surprisingly, kept up their pressure on the government for improvements to the canal system as the only means of reviving profits which had been stagnant for several years. In 1866 the situation was such that sawn timber representing a value of more than $150 000 a year was piling up, unsold, in the vast timber yards in Hull[7] as a result of the inability of the Ottawa River canals to carry the quantities being produced. In the face of the government's increasing hesitation to undertake the work, the petitioners even went so far as to offer to underwrite the cost, subject to being reimbursed after Confederation.[8] The government agreed to these conditions and a contract for improvements to the Ottawa River canal system was signed on 18 May 1867.[9]

Seven months later, when the Goodwin company had completed its work, the waterway was in better condition than it had ever been. The water was 6 feet deep over the lock sills and many sections of the canal basin had been cleaned. In addition, two new turning basins had been provided on the Grenville Canal. At Carillon improvements had been made to the feeder canal and for the first time since its construction the water level was recorded at between 6 and 6.5 feet over the lock sills in the normally low-water month of September. This satisfactory situation, however, was short-lived. After only a few weeks of operation the feeder canal could no longer supply a sufficient volume of water to the Carillon Canal owing to the increasing number of lockages at each entrance. Although the Goodwin contract was still in force, the government decided not to involve itself in any further expenditure at Carillon as a new project for the enlargement of the Ottawa River canals had been under consideration for several months.

Improvement of the water level was considered by many to be the only solution to the navigational deficiencies of the Ottawa River canals. The problem, however, was much more complex, and the government had to face the growing realization that the system in its existing state was no longer meeting the needs created by the growth of the forest industry. Apart from the rapidly worsening structural deterioration of the system, which was giving rise to frequent delays in navigation, traffic was impeded on the upper section of the Grenville Canal by a scale of navigation that was much too small (Fig. 10). Merely increasing the draught was no longer enough; a much larger navigation scale had to

10 Part of dredging fleet at downstream entrance to Grenville Canal in 1940.

be provided to meet existing and future traffic requirements on the Ottawa River canals.

On 16 November 1870 a Canal Commission was appointed to examine canal systems in Canada and recommend improvements where necessary to meet commercial requirements.[10] Implementation of the commission's report, tabled on 24 February 1871, was to bring radical changes to the canal systems on the St. Lawrence, Richelieu, and Ottawa rivers. With respect to the Ottawa River canal system the commissioners recommended a chamber length of 200 feet, a width of 45 feet, and a draught of 9 feet over the sills for the locks of all canals located between Ottawa and Lachine.[11] Parliament accepted these recommendations and voted a total of $425 000 for the enlargement of the canals on the Ottawa River.[12]

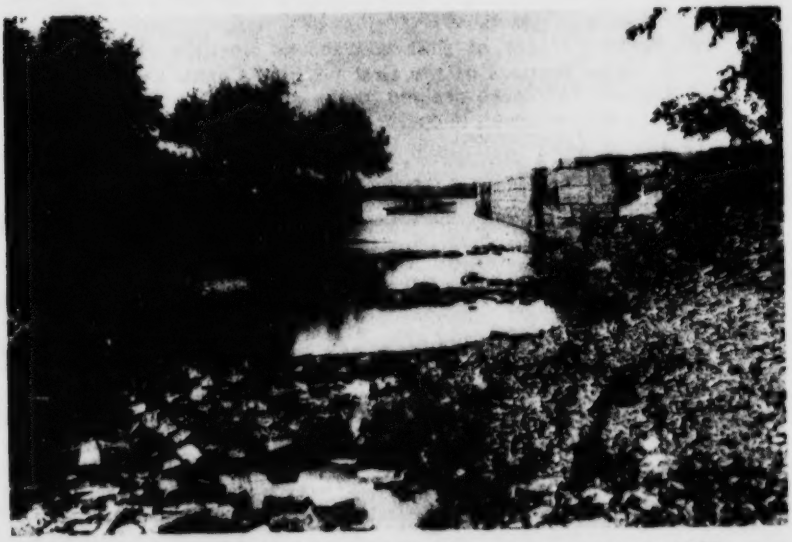
Carillon: New Canal and Constuction of Dam: 1873-82

The work suggested by the Canal Commission to upgrade the Ottawa River canal system represented a formidable challenge for Public Works engineers in the 1870s. They were to provide a larger scale of navigation without impeding commercial shipping during the construction period. This requirement left them no alternative but to build a

whole new canal system parallel to the first. It was a gigantic undertaking as many of the existing locks were in ruins but had to be kept in operation until the second system could be opened. In the interest of conciseness, this study will be confined to the construction period of the new system as only temporary repairs were made to the first canals in the expectation that they would be abandoned.

To solve once and for all the problem of the water supply at the Carillon Canal it was decided to build a dam and a completely new canal with two locks.[13] The location of the dam, three-quarters of a mile upstream from the village of Carillon, had a number of advantages. Besides providing an adequate water basin to supply the two new Carillon locks, it was to raise the level of the Ottawa River so as to submerge the Chute-à-Blondeau rapids[14] and allow uninterrupted navigation between Carillon and the Grenville Canal. Rising from the embankment formed by one side of the upper lock of the new canal, the dam extended a distance of 1800 feet from the north side of the river to its southern end on the opposite bank. The site also included a slide 220 feet wide and 550 feet long,[15] designed to speed the descent of the timber rafts to the Carillon rapids while providing maximum protection for the locks of the new canal.

This canal was a considerable improvement over the old one. First of all it was much shorter, measuring a scant 0.75 mile instead of 2.08 miles, and second it had only two locks, 200 feet long by 45 feet wide,



11 Ruins of lock No. 3 of old Carillon military canal in 1909. Construction of the Carillon hydroelectric dam in 1963 completely submerged this lock as well as the entire section of the first canal, located upstream from the present Carillon lock.

12 Parallel traces of first and second Carillon canals in 1909. Some sections of the first Carillon Canal, abandoned 27 August 1882, were drained in the early 1900s. At right, second Carillon Canal, in operation between 1882 and 1960.

with 9 feet of water over the gate sills. Navigation was thus greatly facilitated as a distance that had necessitated passage through four locks on the old canal now involved only two. With the opening of the new canal the old military locks and the feeder canal were finally abandoned (Figs. 11, 12). The elimination of four of the old locks necessitated a change in the numbering system: the new locks at the Carillon Canal retained numbers 1 and 2 while locks 3 and 4, which the construction of the dam had made redundant, were removed from the series. Table 3 shows the numbering in the old and new canal systems.

For a number of reasons, including poor weather, high water levels on the Ottawa River, and the instability of contractors, the project, which in the original contract was scheduled to be completed in a maximum of 2 years, stretched over an entire decade. An engineering study was completed in June 1872 and calls for tenders were issued on 28 December of that year. On 21 March 1873 a contract for construction of the dam, the slide, and the new Carillon Canal by 1 November 1875 was awarded to R.P Cooke and Co. of Brockville.[16] Because of the unusually high level of the Ottawa River, only the foundation work could be done within the period stipulated in the contract and it had to be extended to 1878. In June of that year the government, dissatisfied with the progress

Table 3. Numbering of old and new canal systems on the Ottawa River

Old canal	Numbering of locks	New canal	Numbering of locks
Carillon	1,2,3	Carillon	1,2
Chute-à-Blondeau	4		*out of service
Grenville	5,6,7,8,9,10,11	Grenville	3,4,5,6,7

*As a result of the rise in the water level produced by the construction of the Carillon dam, the Chute-à-Blondeau lock became redundant and was removed from the system.

of the work, cancelled the contract with Cooke and Co. New calls for tenders were issued and a bid by F.B. McNamee and Co. was accepted in October 1878. Once again, however, for reasons that are still unknown, the contract was cancelled.[17] Finally, under an order in council dated 12 July 1879, the project was divided into two separate contracts: construction of the dam and slide went to the Montreal firm of F.B. McNamee, and the building of the canal and the two locks to R.P. Cooke and Co. of Brockville, the entire project being scheduled for completion by November 1881.[18] Only the first contractor succeeded in meeting the deadline, completing the dam in November 1881. The specifications for the slide had undergone extensive changes from contract to contract; it finally measured 640 feet in length by 26 feet in width.[19] The new canal was officially opened to navigation on 27 May 1882[20] (Fig. 13).

13 Downstream entrances to first two Carillon canals in 1914. At left, entrance to second canal, in operation from 1882 to 1960. At right, entrance to old military canal of 1834, remnants of which can still be seen.

14 Lock No. 1 on second Carillon Canal in 1914. All that remains of this lock, built between 1879 and 1882, is the south wall.

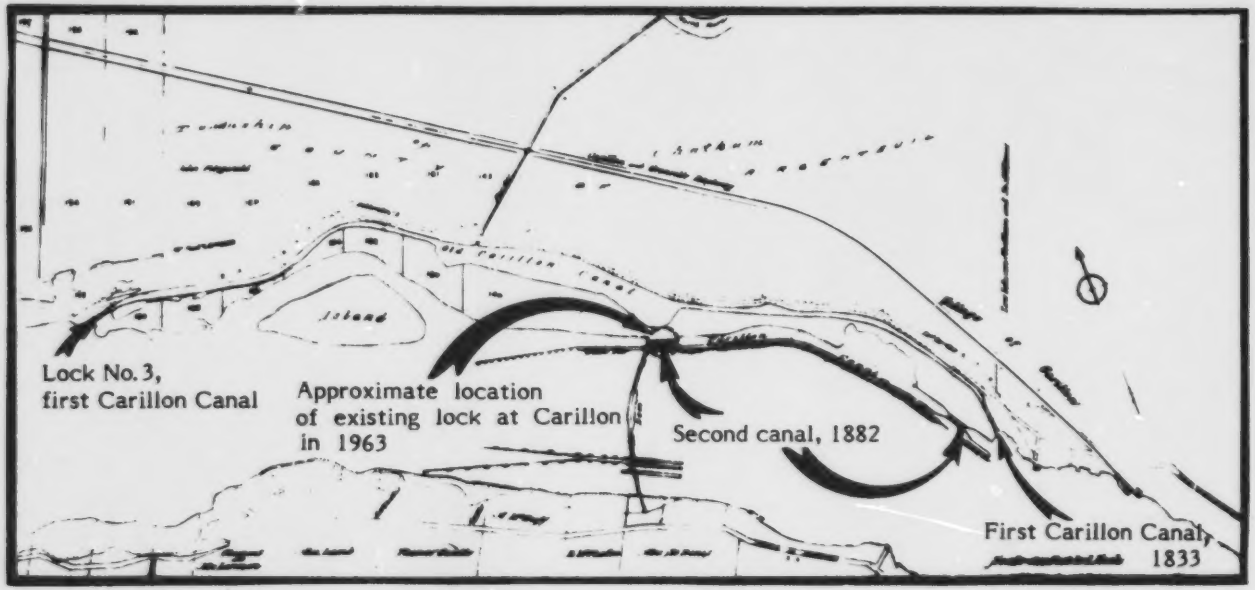
15 The south chamber wall (lateral wall) of lock No. 1 of the second Carillon Canal was saved from demolition when the present Carillon lock was built. It now forms part of the end of the downstream wharf leading to the present Carillon lock.

Little remains of this canal today (Fig. 17). Only the south wall of the lower lock chamber still testifies to the authenticity of its original construction materials (Figs. 14, 15); its lower end, also built about 1880 and used as a mooring wharf, was first reduced in size by some 40 feet and then covered with concrete in 1959 or 1960. Much less spectacular than the preceding remnants, a stone wall, located in the continuation of the wing wall of lock No. 1, extends toward the present lock. This wall formed the south side of the canal embankment, between locks Nos. 1 and 2, at the time of the second Carillon Canal (Fig. 16). These structures, all that remain of the second canal, are part of the downstream wharf leading to the present lock. All traces of the dam and the upper lock of the second canal were erased by the Hydro-Quebec project between 1960 and 1963.

Construction of New Grenville Canal: 1871-84

The recommendations of the Canal Commission with respect to Grenville included construction of locks 200 feet long by 45 feet wide with a depth of 9 feet over the sills, a new canal 10 feet deep with a basin between 50 and 80 feet wide at the surface and 40 feet wide at the bottom, and finally, turning basins spaced about half a mile apart along the length of the canal.[21] Because the canal was more than 5.75 miles long, the work was divided into two sections. The west section extended from the upstream entrance to the Grenville Canal to lock No. 9 while the east section took in the stretch from lock No. 8 to the downstream end. Work began with the west section as it was here that the three small locks of the Grenville Canal were located and their enlargement could not be longer delayed without arousing vigorous protests from shippers of forests products. On 16 August 1872 a contract for improvements to this section of the canal was awarded to James Goodwin, who was to complete the enlargement of locks Nos. 9, 10, and 11 by April 1873.[22]

As soon as the navigation season ended the contractor set about demolishing the walls of lock No. 11; it was rebuilt on the same site as the old military lock but this time on the scale proposed by the Canal Commission. This phase of the reconstruction was not completed until the summer of 1873 although it had been expected that the three upper locks of the canal could be enlarged in time for the opening of navigation in the spring of that year. On the basis of this experience Goodwin decided that the technique used at Carillon should be employed for the remainder of his contract and that the new locks should be built parallel to the old so as not to cause further delays in navigation while the work was in progress. A second contract providing for the relocation of locks Nos. 9 and 10 to a position 40 feet south of the old locks was awarded him on 19 February 1873[23] and these were constructed in time for the opening of navigation in May 1875. It was not until 1881 that all the improvements to the west section were finally completed.



16 Locations of three canal systems at Carillon based on "Plan of the Grenville and Carillon Canals Shewing. Ottawa River Between Greece's Point and-Village-of Carillon." (Drawing: François Pellerin.)

17 Upstream entrance to lock No. 2 of second Carillon Canal in 1914. Nothing remains of this structure because the present Carillon lock was built on the exact site of this lock, between 1960 and 1963.

In the east section, extending from Greece's Point to lock No. 8, the work consisted of replacing the two series of combined locks with two new single locks about a quarter of a mile apart, constructed according to the dimensions and scale recommended by the Canal Commission.[24] This work went on from 1881 to 1884, and when the new Grenville Canal opened in the spring of 1884 the locks of the old military canal were filled in.

Unlike the Carillon Canal, much of this portion of the second canal system has been preserved in perfect condition to this day. Across from Grenville, for example, the guard lock with its wing walls still rises from its foundations; only the gates and the opening mechanism are missing. The upstream entrance to the canal, framed by its two stone walls, is also intact. Downstream from the lock, the walls of the canal can still be seen, cut through the rock. This section of the canal, which extends for several hundred feet, is the only area in which evidence of both the first military canal at Grenville and the second Ottawa River canal system still remains.

Construction of New St. Anne's Lock: 1873-77

Although independent of the Ottawa River canal system, the St. Anne's lock was nevertheless the lower entrance to the waterway by

virtue of its location at the downstream end of the river, near its junction with the St. Lawrence. None of the improvements described above would have remedied the navigation problems while this lock remained as it was. Fortunately, the Canal Commission had recommended upgrading this section of the river as well.

The impediment to navigation at St. Anne's was not the lock itself, but rather the channel leading to it. The shallow depth of water in the approach to the lock seems to have been a continuing problem throughout its history as the first complaint recorded goes back to January 1846, scarcely 3 years after it was opened. In his report on navigation in Canada, Captain Warden criticized the difficult access at both ends of the canal:

> The entrance to it at both ends is so ... bad that at times, when the water in the Ottawa is low, not more than 4 feet water can be ... upon, and that not always to be obtained. The captn of a steamer passing ... a day stated that he repeatedly grounded ... drawing 3 ft 6 in or from that to 4 ft.[25]

In response to numerous complaints of similar difficulties, efforts were made to improve the channel by a series of dredging projects in the 1850s. These produced only superficial results, however, and the approaches to both ends of the canal continued to present difficulties, as indicated in the following report written in 1872:

> The channel immediately above the Lock, besides being crooked, was never excavated to quite the required depth at low water. The channel across the shoal, about one mile below, is also crooked and shallow during low water. There is a bad shoal at the foot of the rapids, below the lock, on which vessels are thrown by the current, at certain seasons, which altogether renders navigation at this point exceedingly difficult.[26]

More extensive work was obviously required to overcome this problem. Before proceeding with the enlargement of the lock, therefore, the Canal Commission decided to deal with improvements to the channel with a view to achieving a uniform scale of navigation with a depth of 9 feet over the entire length of the Ottawa River canal system. Plans were developed and approved, and a contract was awarded to the Albert Becker Company on 22 August 1873. The work consisted of excavating to a depth of 10.5 feet a channel some 1200 feet long and 120 feet wide across the long shoal downstream from the lock. The sides of the channel were to be protected by a series of caissons surmounted by a levee. This project, still known as the Becker dike, was completed in the fall of 1877.[27]

The Public Works engineers now had to go on to the second stage of the improvements called for by the Canal Commission — the enlargement of the St. Anne's lock. Because the cost of reconstruction in winter was prohibitive and commercial navigation could not tolerate the slightest interruption during the shipping season, it was decided to build a new lock between the north bank and the existing lock.[28] The contract

for this project was signed on 26 November 1879, and the new lock, constructed on the scale recommended by the commission (200 feet long by 45 feet wide), went into operation in August 1883.[29]

Hydro-Quebec Project at Carillon: 1959-63

The last and by far the most spectacular changes in the Ottawa River canal system were those made by Hydro-Quebec between 1959 and 1963. Unlike previous undertakings, the Hydro-Quebec project was not designed to increase the commercial viability of the canals but rather to supply electricity to the Montreal area during peak hours.[30]

The structures located at the level of lock No. 2 on the second Carillon Canal include the following: a dam 3700 feet long, 65 feet wide, and 55 feet high; a power plant capable of supplying between 350 000 and 840 000 horsepower to Montreal, as required; a dike 25 feet high on each side of the dam, upstream from it[31]; and finally a lock 188 feet long and 45 feet wide, providing clearance of 65 feet.

At this lock, officially opened for navigation on 3 May 1963,[32] visitors can view some 130 years of technological progress since the building of the first Carillon Canal locks, one of which still stands on the site. The new lock is operated entirely by electricity and is equipped with mitre gates at the upstream entrance and a lift gate downstream; it is the largest of its kind in Canada.[33]

This project, located as it was, inevitably changed the face of the second canal system (Fig. 16): the water level in the Ottawa River rose 62 feet at Carillon, 9 feet at Grenville, and 3 feet at Masson. All the locks upstream from the dam were flooded over with the exception of the guard lock at Grenville, which today is no longer operational. The new Carillon lock now replaces the seven locks on the Carillon-Grenville section.

COMMERCIAL USE OF THE OTTAWA RIVER CANALS

Statistical Sources and Methods of Analysis

The statistics used in analysing the various commodities transported on the Ottawa River canals were compiled with the aid of tables derived from two sources: the *Sessional Papers* of the Province of Canada from 1851 to 1866 and of Canada from 1867 to 1920 and the *Dominion Bureau of Statistics: Canal Statistics* from 1921 to 1970. The absence of statistics for the period 1834-49 is no doubt attributable to the fire that ravaged the offices of the Royal Engineers in Montreal in 1852.

The first detailed statistical records of articles transported on the Ottawa River canals appeared in 1850; with the exception of the year 1859, they cover activity only at the St. Anne's lock up to 1873. Although it might be assumed that these statistics are equally representative of activity on the Carillon Canal, as the St. Anne's lock is located at the downstream entrance to the Ottawa River and articles carried through that lock would have to go through Carillon as well, the statistical tables for the 1859 navigation season (Appendix C) show the fallacy of such an assumption.

These tables, which unfortunately cover only 1 year, are the only ones to show a breakdown of articles transported through the St. Anne's lock and through the Carillon-Grenville canals for the same year of operation. The difference in total tonnage carried at the two locations is staggering: 88 696 tons at St. Anne's (Appendix C) as opposed to 223 569 tons on the Carillon-Grenville canals (Appendix C). With a difference of this magnitude, it is obvious that any statistics applicable to the St. Anne's lock could not be representative of traffic on the Carillon Canal. Because the statistics reflect volumes of goods and commodities passing through canals constructed on the same river, we tried to find an explanation for the wide margin and we believe the answer lies in a comparison of the commodity in which the greatest tonnage was recorded at each canal — sawn timber.

The 1859 tables (Appendix C) indicate that sawn timber was transported only downriver on the Ottawa; 187 050 tons went through the Carillon and Grenville canals whereas only 44 989 tons were recorded at the St. Anne's lock. By subtracting, we find that an impressive total of 142 061 tons of sawn timber went down the Ottawa River canals without using the St. Anne's lock. It seems a logical assumption, therefore, that these 142 061 tons of sawn lumber, carried mainly on barges, must simply have run the St. Anne's rapids at high water, a practice that was very common at the Chute-à-Blondeau rapids.[1] The use of this method for forest products in general would account for the wide discrepancy between the total annual tonnage carried on the Carillon-Grenville canals and that recorded at the St. Anne's lock.

Regardless of the validity or otherwise of this hypothesis, the 1859 tables show that statistics applicable to the St. Anne's lock cannot be

said to be representative of the traffic recorded on the Carillon Canal or on the Ottawa River canals in general. They do pertain to articles carried on the same navigation system, however, and for this reason we are obliged to make use of them, in the absence of more specific data, for the period from 1850 to 1872. Between the years 1860 and 1872, the statistics with respect to articles transported on the Ottawa River canals were combined with those for the Rideau Canal, with the result that they are quite unusable for the purposes of this study. Fortunately, records were kept of articles carried through the St. Anne's lock during this period, and it is on these data that our analysis is based.

The compilation of statistics between 1873 and 1969 was radically different. These data do not apply merely to the St. Anne's lock, but cover the Carillon, Chute-à-Blondeau, and Grenville canals as well, or in other words, the whole Ottawa River canal system. This, therefore, is the only period for which the figures available are truly representative of the total volume of commodities carried on the system. It should be pointed out, however, that the Chute-à-Blondeau Canal ceased operations in 1886,[2] and the Grenville Canal in 1962.[3]

Appendix B lists total annual tonnages without indicating the various goods and commodities involved. Tonnages are divided according to the direction in which the articles were carried, and these figures are then expressed as percentages of total annual tonnage. This compilation shows at a glance, therefore, the main trends in commercial activity on the system: periods of heaviest use, direction of traffic, and finally, decline of the system as a commercial waterway.

The statistics presented in Appendix C, on the other hand, illustrate by 10-year intervals the distribution of the main articles carried on the Ottawa River canals, in terms of total annual tonnage and direction taken by the articles within the system. These data are also expressed in percentages. We should add that we had to select the principal articles only as it would have been impossible to analyse the hundred or so products and commodities listed in the *Sessional Papers* and by the *Dominion Bureau of Statistics*. We chose the years 1859, 1869, 1879, and so on for our 10-year sampling for two reasons: first, because we wished to use the additional information available for 1859, and second, because the last statistics available were for the year 1969. Only the first table in Appendix C deviates from this pattern, because there were no statistics available for the year 1849.

Articles Transported

The various articles carried on the Ottawa River canal system can be grouped for purposes of review into three periods, each reflecting a different economic focus. In its first period of commercial use, extending from 1834 to 1848, the waterway was part of a triangular trade route linking Montreal, Bytown, and Kingston. The articles carried consisted mainly of supplies for the new settlements along the Rideau Canal and near the Great Lakes.

The second period, from 1849 to 1919, coincided with the opening of the improved St. Lawrence waterway, as a result of which economic activity on the Ottawa canals took on a more local character involving mainly the transportation of forest products for export. The third period, from 1920 to 1963, marked the decline of the lumbering era on the Ottawa River canals and the appearance of new products such as sand and gravel.

First Period: 1834–49

Although the Ottawa River canal system was intended to carry traffic in both directions, the articles transported during its first period of commercial use tended to follow a counter-clockwise movement. "It was essentially a one-directional circular pattern with the emphasis on moving merchandise and empty barges from Montreal to Kingston via Bytown and descending the St. Lawrence as before with staples for the Atlantic Trade."[4] This circular movement, Montreal-Bytown-Kingston-Montreal, was in turn made up of two very different trade patterns, which are important to differentiate.

The first was directly related to the delivery of supplies to the new settlements established in Upper Canada. Steamboats loaded with wheat, flour, timber, textiles, and potash made their way up the Ottawa River canals from Montreal and on to Kingston via the Rideau Canal.

18 Barge loaded with lumber preparing to leave Ottawa River canal system at St. Anne's lock. One of these barges could carry up to 300 000 feet of lumber. (Undated, Public Archives of Canada.)

From Kingston, where these commodities were unloaded for distribution,[5] the circular movement continued with the second trade flow. The steamboats, and the numerous empty barges that had been towed to Kingston, were loaded with products from the Great Lakes and Upper Canada destined for Montreal via the St. Lawrence.[6]

Although the absence of statistics prior to 1850 prevents our making a comparison of these two trade patterns, it would seem that the Ottawa River canal system figured more prominently in the second: "Indeed a function of the Ottawa-Rideau up-trade at this time was to supply empty barges at Kingston for the conveyance of wheat, flour and pork in the St. Lawrence down-trade."[7]

Apart from the transport of goods and commodities, the Ottawa River canal system played a leading role with respect to the rising tide of immigration from the British Isles.[8] Most of those who came to settle in Upper Canada during the 1840s travelled over the Ottawa River canal system as the canalization of the St. Lawrence was not completed until the end of the decade. Between 1840 and 1841, more than 24 000 immigrants reached the settlements in the Ottawa Valley and Upper Canada by way of the Ottawa River canals and the Rideau Canal; the number rose to 30 000 in 1842 and reached a peak of 89 562 in 1847.[9] As might be expected, however, the improvement of the St. Lawrence canals toward the end of the 1840s caused an abrupt drop in the number of passengers carried on the Ottawa waterway as the immigrants preferred the more direct route over the new St. Lawrence circuit.[10]

Second Period: 1849-1919

The second period of commercial activity can aptly be termed the timber era as the total tonnage of forest products came to more than 83.3%[11] of all articles transported through the St. Anne's lock and the Ottawa River canals. Sawn timber (Fig. 18) was directly responsible for this high percentage, reflecting a rapid rise from 24 143 tons in 1850 to 249 089 tons in 1869, and in 1889 registering the largest tonnage for any single article in the commercial history of the canals with 550 472 tons.

The increase, however, was not surprising. By the end of the 1840s the Americans had virtually exhausted stocks of red and white pine in New England and northern New York State, while at the same time the demand for lumber was increasing throughout the northeastern states.[12] The depletion of American forests, however, was only one reason for the growth of the sawn timber trade in the Ottawa Valley. The decline in exports of squared timber to the British market was an equally significant factor.

> By 1840, the continental blockade had become merely a faded memory and Great Britain was eyeing the cheaper timber from the Baltic with interest ... in 1842, she revoked the preference, and immediately supplies flooded in from Scandinavia, displacing Canadian timber
>
> .....
>
> Something had to be done; it was decided to ship some of the logs

in the rough and to process the remainder on site into worked or semi-finished products, for sale to Canadian buyers and to the vast market that was shortly to open up in the United States. The age of the sawmill was dawning. [Translation.][13]

On 5 June 1854 the already favourable prospects for sawn timber were enhanced by the signing of the reciprocity treaty, which remained in effect until 1866, giving Ottawa River timber duty-free access to the American market. The future was bright for sawn timber, and the number of sawmills in the Ottawa Valley increased. To the Bronson & Weston and the A.H. Baldwin mills established in 1853 were added those of E.B. Eddy and Levi Young in 1854, Perley & Pattee in 1857, and later those of J.R. Booth, Batson & Currier, Gilmour & Co., Le Moyne, Gibb & Co., and finally Hamilton & Co.[14]

The American government's imposition of a 20% tax on imports of Canadian sawn timber after 1866 did not have the adverse effect that might have been expected on shipments of this commodity over the Ottawa River canals.[15] Indeed, the 1879 and 1889 data in Appendix C show a substantial increase in the tonnage of sawn timber, which rose from 302 418 to 554 436 tons[16] in the two decades following the abrogation of the reciprocity treaty. The negative effects that the imposition of a customs tariff might have had were offset by the growth of cities in the American Midwest and particularly in New England, which provided a prime market for sawn timber from the Ottawa Valley.[17]

Although sawn timber was still the principal commodity carried on the Ottawa River canals in 1919, traffic had begun to diminish in the 1890s and by 1899 it had fallen from 550 472 to 406 314 tons. In 1909, 197 040 tons were recorded, and the succeeding three decades were to mark its gradual disappearance. By 1939 forest products in total represented a mere 2.2% of articles carried (Appendix C). This very rapid decline was directly attributable to the appearance of the railroad, the effects of which had begun to be felt in 1887.

> The Ottawa River canals are meeting stiff competition from the Canadian Pacific and the Canada Atlantic for the transport of timber from the district. The following are the quantities transported on these two lines in the last two years: in 1887, 100,369,426 feet; in 1888, 319,923,600 feet. The quantities carried by the canal were as follows: in 1887, 336,094,000 feet; in 1888, 319,923,600 feet ...; there was an increase of 18,935,088 feet in the transport of timber by rail, and a decrease of 15,170,400 feet in the transport by water. [Translation.][18]

The gap widened as the 20th century began and the railroad, with its greater mobility, further supplanted water transport by loading sawn timber directly from the timber yards at the Chaudière Falls.[19] Cordwood and rafts of squared timber, as well as sawn timber, went down the Ottawa River canals during this period, but in much smaller quantities.

A number of observations can be made on the basis of an analysis of the table showing the total annual tonnage of articles carried on the

Ottawa River canals (Appendix B). In terms of the direction of the traffic, for example, we can see that the St. Anne's lock and the Ottawa River canals were used mainly for downstream transport, i.e. from Ottawa to Montreal, not only during the second period of the system's commercial use but also from 1850 to 1963. The only significant deviations from this pattern occurred in the 1930s, 1940s, and 1960s, when as much as 39.6, 54.6, and 62.8%, respectively, of articles transported were carried upstream.

In the period in which we are particularly interested, we find that cargoes were made up mainly of forests products, and that a very high proportion of these moved down the Ottawa River canals: 91.3% between 1850 and 1869, 99.3% between 1871 and 1889, and finally, 87.5% between 1890 and 1919. In the first two decades of this period little use was made of the canals for upstream transport; what activity there was appears to have been attributable to consumption of agricultural products by the numerous lumber camps on the Ottawa. The annual consumption of one of the camps is a good indication of the volume of this traffic between 1850 and 1870.

> Of the agricultural produce used by the Hon. John Hamilton and Brother at Hawkesbury, there are expended 750 tons of hay, 25,000 bushels of oats, 5,000 bushels of turnips, 6,000 bushels of potatoes, 1,000 barrels of pork, 9,000 barrels of flour and 2,000 barrels of oatmeal in the wood alone. So that 2,000 tons of agricultural produce is consumed by this firm alone.[20]

Consumption of agricultural products in the Ottawa River area is reflected also in the tables for 1859 and 1869 (Appendix C), which indicate the quantities of beef, pork, flour, fish, and wheat, as well as imported commodities such as molasses and salt, carried up the canals during those two decades. These products, however, represented only a small percentage of the total annual tonnage carried, declining from 8.4% in 1859 to only 2.1% in 1869 and remaining at a fraction of 1% until 1908.

The decline in imports of agricultural products into the area along the Ottawa River was attributable not to the increasing remoteness of the lumber camps, which were the main outlets for these commodities, but to the area's agricultural self-sufficiency from the 1870s on. The 1879 table (Appendix C) shows, in fact, that surpluses of peas, oats, flour, and barley were shipped down the Ottawa River canals to Montreal. In addition to agricultural products, local farmers took advantage of the proximity of the canals to send their potash and pearl ash (two products derived from the ashes of tree stumps) to Montreal.

One last comment should be added before leaving this second period of commercial activity. After some 36 years of preponderantly downstream traffic on the Ottawa River canals, movement was re-established in both directions during the last decade of this period, when bituminous coal, sugar, salt, and miscellaneous merchandise carried upriver averaged 14.2% of the total volume of articles transported.

Third Period: 1920-63

The decline in timber, which had begun on the Ottawa River canals three decades earlier, grew more pronounced during the 1920s when total tonnage fell from 114 355 to 41 280 tons between 1919 and 1929. By the 1930s it had all but disappeared, accounting for only 2.2% of all articles carried on the system (Appendix C). Sawn timber, which still totalled 51.7% of all commodities in 1919, represented no more than 7.5% in 1929 and disappeared from the canals altogether in the 1930s. At the beginning of this third period of commercial use, total tonnage of articles transported on the canals was scarcely a third of the volume that had been carried in the 1880s.

Fortunately for the economic survival of the canal system, sand and gravel replaced timber as the main raw material transported, with tonnages that reached 427 820 in 1929, 152 000 in 1939, 277 500 in 1949, and 327 600 in 1959. While these two commodities were being carried to Montreal (Fig. 19), gasoline, oil, and bituminous coal were coming up the canal system in such quantities between 1931 and 1942 that for the first time in its history as a commercial waterway, articles being transported downstream and those moving upstream approached a balance[21] (Appendix B). It was a precarious balance, however; by 1942 upstream shipments represented only 13.3% of total tonnage carried.

Quantities of agricultural commodities transported on the canals remained negligible during this third period, the only activity of any consequence being the shipment of 6776 tons of hay in 1929. The volume of newsprint carried reached 20 000 tons in 1939, but this product declined rapidly and in 1949 accounted for only 3303 tons. From then until 1959, when work began on the construction of the dam and the new lock at Carillon, sand and gravel made up more than 98% of the total tonnage carried on the Ottawa River canals. The official opening of the new Carillon lock in 1963 marked the end, for all practical purposes, of commercial navigation on the canal system.

19 Type of motorized barge used to carry oil, at downstream entrance to Grenville Canal in 1930. (Public Archives of Canada.)

Principal Users of the Ottawa River Canals

For nearly 10 years following the opening of the Ottawa River canal system, commercial activity on the river was dominated by the Ottawa and Rideau Forwarding Company (hereafter referred to as the ORF), a powerful navigation company that was amalgamated with McPherson and Crane in 1837.[22] The ORF, in fact, controlled most of the towing operations between the canals on the Ottawa River by means of its monopoly of the Vaudreuil lock, located at the downstream entrance to the canal system, near the St. Lawrence River.

We have referred to this monopoly in an earlier chapter. Only steamers belonging to the ORF had access to the Vaudreuil lock, but barges owned by most of the other companies were allowed through.[23] The rates demanded by the ORF were so high, however, that they seem to have eliminated any possible competition.[24] Rival companies were forced to haul their boats through the channel by means of a winch mounted on a wharf located above the Vaudreuil rapids.

The monopoly at the Vaudreuil lock, although a prime asset, was not the only advantage the ORF held over its competitors. It was one of the few shipping companies to own a steamer capable of navigating through the three small locks on the Grenville Canal.[25] All these factors lead us to believe that most of the ORF's competitors had to operate mainly upstream from the Grenville Canal until 1841. It was in that year that Captain R.W. Shepherd, operating for the H. & S. Jones Company of Brockville (probably an amalgamation of J. Jones & Co. with Hooker and Henderson), at last succeeded in breaking the monopoly when he discovered a navigable channel 3.5 feet deep through the Vaudreuil rapids.[26] The ORF was forced to come to terms with this company which could now offer stiff competition, particularly as it was also the owner of a steamer capable of navigating the Grenville Canal.

To avoid any conflict of interest at the downstream entrance to the canals, an initial arrangement was worked out between the two companies whereby the H. & S. Jones barges could use the Vaudreuil lock. It was also agreed that that company's steamers would be responsible for towing barges between Lachine and Vaudreuil, while the ORF would have corresponding rights between Vaudreuil and Carillon.[27] A similar agreement was arrived at with regard to passenger transport, and the negotiations resulted in the establishment of the first regular service between Lachine and Bytown. In the spring of 1842 the H. & S. Jones steamer *Oldfield* went into service between Lachine and Carillon while the *Albion*, owned by the ORF, plied between Grenville and Bytown. A stagecoach service, later replaced by a railway line, completed the circuit between Montreal and Lachine and between Carillon and Grenville (Figs. 20 and 21). It seems fair to say, therefore, that the monopoly at the downstream entrance to the Ottawa River canals was shared by these two companies in 1841. It was an arrangement, however, that was soon to become generalized. In 1843 the Vaudreuil lock was replaced by the lock at St. Anne's, to which all competitors had access.

The two navigation companies referred to above, however, were

20 *Duchess of York* at Carillon. (Undated, Public Archives of Canada.)

21 Close-up of locomotive and two cars used to carry passengers between Carillon and Grenville. This railway, which went into operation 25 October 1854, became the property of the Ottawa River Navigation Company in 1859; service was maintained until about the 1920s. (Undated, Courtesy Argenteuil County Historical Society.)

not the only ones to use the canal system at this time. According to V.A. George there were five shipping companies operating on the triangular circuit formed by the Ottawa River canals, the Rideau Canal, and the St. Lawrence River in 1841:

Ottawa and Rideau Forwarding in association with McPherson and Crane		11 steamers	45 barges
J. Jones & Co.		3 steamers	25 barges
Sanderson & Murray	2 steamers	3 steam barges	22 barges
W. Dickinson & Co.			15 barges
Hooker & Henderson		3 steamers	26 barges[28]

It has not been possible, unfortunately, to ascertain exactly how many steamers and barges were assigned by each of these companies to the Ottawa River canals, but we have a fairly accurate idea of their dimensions. Because of the narrowness of the three upper locks of the Grenville Canal, access to all the canals was limited to boats of a maximum length and width of 95 by 18.5 feet, with a draught of 5 feet; cargo, moreover, was restricted to 100 tons.[29]

During this period, therefore, and until 1884 most steamers were excluded from the Ottawa River canals as the smallest of them were more than 100 feet long. Only barges could cover the full length of the system.[30] These motorless craft were first towed by steamboats to the ends of the various canals and were then hauled between the locks and through the canals by horses (Figs. 22 and 23). Two types of barge saw service on the canals in the course of their history, first the round-bottomed barge, and beginning in the early 1860s the flat-bottomed scow, which had a greater load capacity.

In view of the reduced scale of navigation on the Ottawa River canals, it was not surprising that much of the commercial traffic was diverted to the St. Lawrence canals, which had been enlarged toward the end of the 1840s. These could accommodate vessels up to 140 feet long and 30 feet wide with a 9-foot draught. Unable to compete with the St. Lawrence for the Great Lakes traffic, the Ottawa River canals found a new commercial role in the second half of the 19th century as a waterway for forest products. By 1872 transportation of these products had attracted the interest of many users of the canal system:

> There are at present fifteen companies or firms involved in navigation on the Ottawa River, representing capital of more than $1-1/4 million. During the navigation season, these companies employ 241 barges, 45 steamers and nearly 2000 men. [Translation.][31]

Among the principal shippers we should include some of the major lumber companies that had their own transportation facilities and could operate quite independently of the navigation companies. One of the most powerful of these was Bronson & Weston, which in 1853 became the first to set up operations near the Chaudière Falls. The annual

22 A barge, the most popular means of transporting goods on the Ottawa River canals from 1834 until after the 1940s. This type of barge was also used on other canals in the province, such as the Chambly Canal and the St-Ours lock. (Public Archives of Canada.)

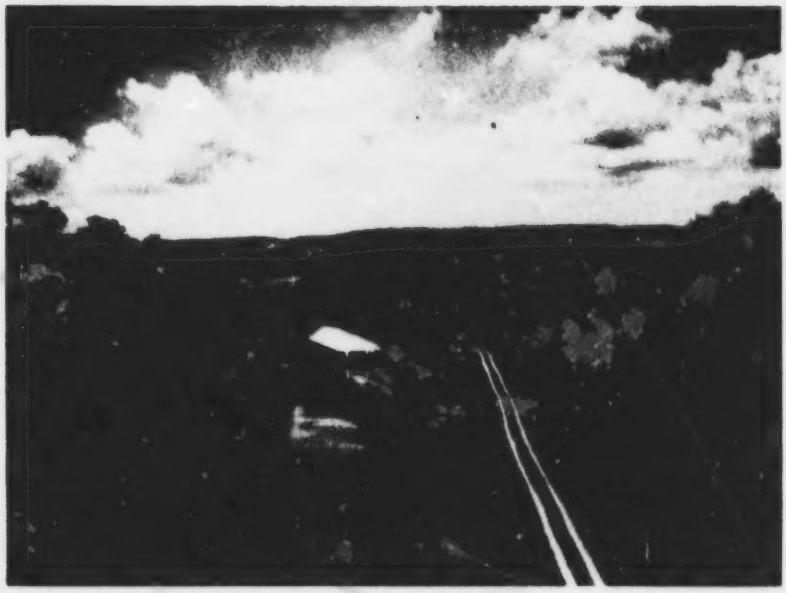
production of this company in the 1870s was estimated at between 30 and 40 million feet of timber; it maintained a fleet of 26 barges and nine steamers, manned by 222 men, to transport its production on the Ottawa River canals.[32]

This example was followed in 1853 by A.H. Baldwin. In addition to its two sawmills, it had its own shipyard where 16 barges and a steam barge were built. In 1871 the Baldwin fleet included 14 barges, two tugs, and a steam barge, and employed 80 men.[33] The equally well-known John R. Booth also used his own barges to ship pine planks and battens to the American market, but the composition of his fleet is unknown. It appears, however, that his barges went down the Ottawa River canals and then followed the Richelieu and Lake Champlain route to New York.[34] His fleet, like those of most of the navigation companies involved in the transportation of forest products, was eventually merged with D. Murphy & Co. to form the Ottawa Transportation Company in 1892.[35]

The Ottawa Transportation Company, with a fleet estimated at more than 250 boats and barges,[36] became through this amalgamation the most powerful navigation company in the history of the Ottawa River canal system. In 1892 it was already controlling 90% of the towing operations on the Carillon Canal, a proportion equivalent to the volume of forest products being carried down the system at that time.[37] It seems evident from the statistical table of 1899 (Appendix C) that the Ottawa Transportation Company must have maintained this very high level of activity to the close of the century, as timber still accounted for 97.6% of articles carried on the canals at the end of that decade.

The 20th century, however, was to prove considerably less profitable. The downturn was heralded by a fire in the spring of 1900 which caused extensive damage to timber storage facilities in Ottawa. This event had serious repercussions for the company; its president, Denis Murphy, in his annual report for 1900, described the year as the least productive the company had experienced since its founding in 1892.[38] In the same report, Murphy announced that 15 barges, though only recently repaired, had been taken out of service at the beginning of the 1900 navigation season because of a lack of timber. He went on to report that "Five barges, the *Arm, Neva, Nile, Maclaren* and *Young*, are unfit for further use and will have to be abandoned, thus reducing the number of useful barges to 67, which is now too large to meet an ordinary spring business."[39] The report of the 1902 navigation season, announcing further reductions in the company's fleet, was scarcely more encouraging for the shareholders:

23 At centre left of photograph, location of horse stable which stood at upper end of lock No. 2 on second Carillon Canal in early 1930s. (Courtesy Argenteuil County Historical Society.)



24 Type of steel barge used to transport sand and gravel in 1930s. (Courtesy Argenteuil County Historical Society.)

> During last year we sold the barge *Walcot* for $500., as she was no longer of use to our business, and we were obliged to abandon the barge *Burstall* on account of her age and condition. The following 7 barges viz *Alice*, *Cooper*, *Dudley*, *Herbert*, *Howard*, *Toms*, and *Woodbury*, are now too old and rotten to be used any longer, and will have to be dropped from our active fleet, reducing the number of serviceable barges to 60. In addition to the above 5 barges, viz *Armenia*, *Clarence*, *May*, *Ned*, and *Perley*, will have to be dropped after this coming season.[40]

This situation was mainly attributable to the railroad, which was taking over the transportation of an ever-increasing volume of forest products. Toward the end of World War I, the Ottawa Transportation Company's fleet numbered only five tugs and fewer than 40 barges. Legget indicates that the company finally surrendered its charter in 1941. This would have been a logical step as by the end of the 1930s the annual tonnage of timber transported on the Ottawa River canals represented 2.2% of the total volume of commodities carried on the system.[41]

Although it had specialized in the shipment of forest products, the Ottawa Transportation Company turned in its final years of operation to

the transport of coal and oil from Montreal to Ottawa. Two companies, the Consolidated Oka Sand & Gravel Co. Limited and the Simpson Towing & Salvage Company, seem to have shared the transport of sand and gravel on the Ottawa canals around 1934.[42] Little is known about their fleet, other than that they used enormous steel and wooden barges (Fig. 24) capable of carrying 1000 and 500 tons, respectively, of sand, gravel, or coal.[43]

CONCLUSION

In the foregoing pages we have endeavoured to show the extent to which the Carillon Canal was dependent upon the various other canals constructed along the same waterway. As a glance at its geographic location will show, it could scarcely have operated in isolation from the Ottawa River navigation route. Its central position between the canals at Vaudreuil and St. Anne's on one side and those at Grenville and Chute-à-Blondeau on the other placed it in a position of almost total dependence on these canals which constituted the only access to it for goods travelling either upstream or downstream

Operations on the Carillon Canal were thus particularly vulnerable to the commercial and structural restrictions imposed on it by the monopoly exercised by the Ottawa and Rideau Forwarding Company at the downstream entrance to the Ottawa River canal system and the reduced scale of the Grenville Canal at the upstream end. In light of these facts, a historical overview of the whole Ottawa River canal system becomes not only useful, but indispensable to an understanding of the history of the Carillon Canal.

In our review of the antecedents of the Ottawa River canal system we have seen that the so-called official canalization of the river was preceded by a number of primitive "canals" (so defined because of the absence of locks). Although several hypotheses have been formulated regarding the date of their construction, the possible builders, and even the purpose they served, these primitive "canals" remain an enigma that only extensive research can attempt to solve.

Between 1829 and 1834, the Carillon, Chute-à-Blondeau, and Grenville canals were assigned a specifically military role, their primary purpose being to ensure a route for the transport of troops and matériel between Montreal and Kingston in the event of a second conflict on the St. Lawrence. Though the occasion never arose, the canals could no doubt have fulfilled this defensive role as their complete isolation from the St. Lawrence guaranteed considerable freedom of movement under war conditions. To what extent their existence may have averted any further conflict on the St. Lawrence is a question we cannot answer, though it is one that their defence potential readily brings to mind.

Although territorial defence was the sole purpose of the canals at the time they were constructed, they began to be used for commercial navigation as soon as they went into operation. This was the core of the problem. The Carillon Canal, and indeed the whole Ottawa River canal system, was inadequate to meet the commercial needs of the day, and particularly the requirements of the lumber industry, because the scale of navigation in the Vaudreuil lock and the three upper locks of the Grenville Canal was barely large enough to accommodate the smallest steamers in use at the time. Even when the Vaudreuil lock was replaced by the lock at St. Anne's the situation remained unchanged, as the Grenville Canal continued to strangle navigation at its upper end. The establishment of numerous sawmills in the early 1850s and an increasing demand from the United States for sawn timber from the Ottawa Valley

merely served to accentuate the problems associated with the commercial use of the Ottawa River canals.

It was in this context that a major reconstruction of the Ottawa River canal system was undertaken between 1873 and 1884. Although the new system was now capable of meeting the American demand for forest products, competition from the railroad was such that by the end of the 1920s total tonnage of sawn timber carried on the canals represented only 7.5% of the total annual volume,[1] compared with the level of 86.7% it had reached in 1889.[2] Transport of sand and gravel marked the approaching end of commercial activity on the Ottawa canals. Today the locks at St. Anne's and Carillon serve only pleasure craft.

Appendix A. Report and Estimate of the probable expense of constructing a Canal to turn the Carillon Rapids, as connected with a Feeder from the North River, to be completed in two years from the commencement; amounting to £45,464.0.4 sterling

(Québec (province). Bibliothèque de la Legislature. *British Parliamentary Papers*, Session 1825-32, Vol. 6, transcriptions, p. 482, Henry Du Vernet, 16 May 1830.)

HAVING ascertained that the North River, which flows through the wild lands on the north side of the Ottawa, and falls into it below the village of St. Andrew's, was on a higher level, and approached so near in one situation as to be available as a Feeder for the proposed Carillon Canal; after a careful examination of the ground, it is considered the line laid down on the accompanying Plan is the nearest and best, the distance being only 1,150 yards, and without any cutting through high ground.

By the construction of two Dams on the North River, in the situations marked, of nine feet in height, a depth of four feet in water, with the trifling excavation shown by the Section, may be obtained at all times, and may be used as a Canal for Batteaux, for the conveyance of produce from the Back Settlements, if required, as it is proposed making it 12 feet wide at the bottom, with slopes of 45 degrees; a Sluice being placed at the end near the Canal, the walls will serve as the piers for the bridge for the high road, which it will be necessary to make along the ridge.

By constructing a Dam 10 feet high across the lower end of the valley, from the lowest part of the ridge to a projecting bank, in a diagonal direction, and cutting six feet and a half deep below what is considered the highest rise of the Ottawa at the upper entrance of the Canal, the same level may be continued throughout, and strong banks be formed by cutting through the bank, as expressed on the Plan, and forming the valley into a Bason. A lock will be necessary at the upper entrance, 21 1/2 feet high, to admit of boats entering it at the lowest water, and to be above the influence of the highest. At the lower end a double lock of 10 1/2 feet lifts the coping of the upper of an equal height with the first, and that of the lower 15 1/2 feet above what is considered low water at the foot of the rapid. Near the dam it is proposed making a Waste Weir over the rocky bank, to carry off the superfluous water into the Ottawa over the cliff. According to this project, the great expense of cutting through rock, which was necessary in the former Plan, will be saved, and a reduction made from £72,318.3.7 3/4. to £45,464.0.4. in the construction of the Canal, which will not only be wider, but will be capable of being navigated by boats drawing seven feet of water, if required, and may be completed a year sooner.

Chatham, (signed) Henry Du Vernet
16th May 1830. Lt Coll Royl Staff Corps.

ESTIMATE:

PORTION OF WORK, AND DETAIL.	Sterling Amount of each Item.			Sterling Amount of each Portion.		
	£	s.	d.	£	s.	d.
Dam across the North River below the entrance of the proposed Feeder, in length 200 feet.....	475	-	-			
Dam across the Channel round Isle aux Châts, of a similar description, in length 150 feet...	356	5	-			
Clearing on the site of the Feeder 8 acres, at per acre, £4.....	32	-	-			
Excavation of 10,575 cubic yards of earth and rock, including the removal of stumps and boulders, at per cubic yard, 1s. 6d.	793	2	6			
Bridge for High Road, and Sluice...	320	12	-			
Making Total for Feeder.....				1,976	19	6
Excavation of 114,095 cubic yards in formation of Canal, nearly equal portions of earth and rock, including the removal of numerous boulders, at per cubic yard, 2s. 6d.	14,261	17	6	14,261	17	6
Excavation for Nº 1, Lock, Pit, and upper Entrance from River Ottawa, 7,058 cubic yards, at 5s...	1,764	10	-			
Excavation for Nº2, Lock, Pit, in rock, 3,708 cubic yards, at 5s.....	927	-	-			
Excavation for Nº 3, Lock, Pit, in rock and water, 5,032 cubic yards, at 6s.	1,509	12	-			
Making for Excavation, Total.....				4,201	2	-
Dam across Valley, 450 feet long, 10 feet high.....	825	6	-	825	6	-
Waste Weir.....	163	7	6	163	7	6
Grubbing in Valley, 8 acres, at per acre, £10.....	80	-	-	80	-	-
Dry Masonry in Pier or Break-water at the proposed Lower Entrance to Canal, 611 toises, at £1.....	611	-	-	1,411	-	-
Wheeling of Excavation to fill in behind Pier, extra.....	800	-	-			

Excavation through rock in bed of River, in clearing lower Entrance, 1,166 cubic yards, at 6s. 6d.....	378	19	-	378	19	-
Two Coffer Dams, and Machinery for pumping.....	600			600	-	-
Lock at upper Entrance, as per former Estimate.....	5,641	7	-			
Two Locks at Lower Entrance.....	10,988	9	4	16,629	16	4
Two Lock Houses, as per former Estimate.....	299	17	4	299	17	4
New Road.....	433	6	8	433	6	8
Fencing.....	69	6	8	69	6	8
				41,330	18	6
Contingencies, to.....				4,133	1	10
Total Amount Sterling.....				£.45,464	-	4

(signed) Henry Du Vernet
Lieut. Col. Royal Staff Corps.

Royal Engineer Office, Quebec
29th May 1830.

(signed) E.W. Durnford,
Colonel Commanding Royal Engineers, Canada.

Appendix B. Total annual tonnage of articles carried on Ottawa River canals, 1850-1969.
(These statistics were compiled with the aid of tables derived from the *Sessional Papers* of the Province of Canada (1851-66) and of Canada (1867-1920) and from *Dominion Bureau of Statistics: Canal Statistics* (1921-70))

Navigation season	Articles Carried, Tons	Upstream Tons	Upstream %	Downstream Tons	Downstream %
1850*	59 830	9 578	16.00	50 252	84.00
1851*	105 923	10 940	10.30	94 483	89.70
1852*	99 054	11 434	11.50	87 620	88.50
1853*	137 159	14 190	10.30	122 969	89.70
1854*	120 069	19 037	15.90	101 032	84.10
1855*	126 361	14 285	11.30	112 076	88.70
1856*	169 401	10 784	6.40	158 617	93.60
1857*	148 845	10 425	7.00	138 420	93.00
1858*	154 444	11 839	7.70	142 605	92.30
1859*+	88 696 +	13 843	15.60	74 853	84.40
1860*	204 574	14 852	7.30	189 722	92.70
1861*	199 097	15 133	7.60	183 964	92.40
1862*	228 096	11 763	5.20	216 333	94.80
1863*	240 370	14 221	5.90	226 149	94.10
1864*	47 410	3 237	6.80	44 173	93.20
1865*	239 530	15 700	6.60	223 830	93.40
1866*	282 501	14 983	5.30	267 518	94.70
1867*	343 139	19 928	5.80	323 211	94.20
1868*	373 583	19 923	5.30	353 660	94.70
1869*	376 162	22 623	6.00	353 539	94.00
1870*	483 346	16 038	3.30	467 308	96.70
1871*	358 962	11 753	3.30	347 209	96.70
1872*	100 865	949	0.90	99 916	99.10
1873*	433 851	1 820	0.40	472 031	99.60
1874	559 988	1 636	0.30	558 352	99.70
1875	497 498	2 257	0.40	495 237	99.60
1876	440 625	2 075	0.50	438 550	99.50
1877	554 105	1 848	0.30	552 257	99.70
1878	454 793	1 756	0.40	453 037	99.60
1879	455 554	1 549	0.30	454 005	99.70
1880	532 795	5 229	1.00	527 556	99.00
1881	698 260	10 620	1.50	687 640	98.50
1882	790 400	2 374	0.30	788 026	99.70
1883	767 785	3 884	0.50	763 901	99.50
1884	752 832	1 711	0.20	751 121	99.80
1885	763 236	364	0.04	762 872	99.95
1886	745 141	2 386	0.30	742 755	99.70
1887	683 047	638	0.10	682 409	99.90
1888	693 249	192	0.03	693 057	99.97
1889	705 132	172	0.02	704 960	99.98
1890	712 384	569	0.08	711 815	99.92
1891	585 041	871	0.10	584 170	99.90
1892	647 011	552	0.10	646 459	99.90
1893	581 521	1 049	0.20	580 472	99.80
1894	562 010	353	0.10	561 657	99.90
1895	541 220	173	0.03	541 047	99.97
1896	458 876	73 381	0.08	458 495	99.90
1897	502 633	81	0.02	502 552	99.98
1898	549 986	1 401	0.30	548 585	99.70
1899	520 105	445	0.10	519 660	99.90
1900	389 145	299	0.10	388 846	99.90
1901	445 862	935	0.20	444 927	99.80
1902	444 682	82	0.02	444 600	99.98
1903	436 473	922	0.20	435 551	99.80
1904	335 993	562	0.20	335 431	99.80
1905	390 771	263	0.07	390 508	99.93
1906	397 415	240 158	60.40	157 257	39.60

Navigation season	Articles Carried, Tons	Upstream		Downstream	
		Tons	%	Tons	%
1907	337 850	324	0.10	337 526	99.90
1908	258 527	2 358	0.90	256 169	99.10
1909	336 939	54 456	16.20	282 483	83.80
1910	385 261	57 729	15.00	327 532	85.00
1911	320 071	57 702	18.00	262 369	82.00
1912	392 350	56 827	14.50	335 523	85.50
1913	365 438	54 170	14.80	311 268	85.20
1914	335 132	61 256	18.30	273 876	81.70
1915	272 370	48 399	17.80	223 971	82.20
1916	237 651	22 368	9.40	215 283	90.60
1917	214 835	24 455	11.40	190 380	88.60
1918	167 170	19 952	11.90	147 218	88.10
1919	218 438	18 405	8.40	200 033	91.60
1920	233 329	21 236	9.10	212 093	90.90
1921	171 769	18 084	10.50	153 685	89.50
1922	213 227	30 879	14.50	182 348	85.50
1923	233 092	25 512	10.90	207 580	89.10
1924	205 534	26 133	12.70	179 401	87.30
1925	214 940	30 287	14.10	184 653	85.90
1926	321 456	33 690	10.50	287 766	89.50
1927	455 759	36 393	8.00	419 366	92.00
1928	487 786	43 072	8.80	444 714	91.20
1929	537 037	50 672	9.40	486 365	90.60
1930	540 933	95 276	17.60	445 657	82.40
1931	492 919	80 760	16.40	412 159	83.60
1932	253 523	85 427	33.70	168 096	66.30
1933	253 764	149 857	59.00	103 907	41.00
1934	273 121	146 192	53.50	126 929	46.50
1935	289 526	121 004	41.80	168 522	58.20
1936	261 493	103 779	39.70	157 714	60.30
1937	349 078	162 833	46.60	186 245	53.40
1938	299 693	135 341	45.20	164 352	54.80
1939	301 671	129 439	42.90	172 212	57.10
1940	317 412	145 137	45.70	172 275	54.30
1941	309 509	113 349	36.60	196 160	63.40
1942	289 970	38 602	13.30	251 368	86.70
1943	240 496	45 535	18.90	194 961	81.10
1944	272 211	64 250	23.60	207 961	76.40
1945	258 172	73 821	28.60	184 351	71.40
1946	261 295	45 417	17.40	215 878	82.60
1947	254 827	4 884	1.90	249 943	98.10
1948	263 343	1 345	0.50	261 998	99.50
1949	282 330	1 527	0.50	280 803	99.50
1950	294 604	5 742	1.90	288 862	98.10
1951	277 171	1 250	0.40	275 921	99.60
1952	201 151	430	0.20	200 721	99.80
1953	243 032	735	0.30	242 297	99.70
1954	190 810	445	0.20	190 365	99.80
1955	206 525	425	0.20	206 100	99.80
1956	283 500	-	-	283 500	100.00
1957	356 640	180	0.05	356 460	99.95
1958	189 980	-	-	189 980	100.00
1959	327 643	43	0.01	327 600	99.99
1960	278 200	100	0.04	278 100	99.96
1961	196 977	777	0.40	196 200	99.60
1962	300	150	50.00	150	50.00
1963	8 031	7 055	87.80	976	12.20
1964	12 681	11 016	86.80	1 665	13.20
1965	749	239	31.90	510	68.10
1966	489	483	98.80	483	1.20
1967	73	73	100.00	73	-
1968	12	12	100.00	12	0.00
1969	696	671	96.40	671	3.60

* These statistics apply to the St. Anne's lock only.
+ Goods carried on the Carillon-Grenville canals totalled 223 569 tons in 1959.

Appendix C. Distribution, by 10-year intervals, of main articles carried on Ottawa River canals, 1850-1969
(Statistics compiled with the aid of tables derived from the *Sessional Papers* of the Province of Canada (1851-66) and of Canada (1867-1920) and from *Dominion Bureau of Statistics: Canal Statistics* (1921-70))

Articles	Total tonnage	Tonnage upstream	%	Tonnage downstream	%	% of total annual tonnage
St. Anne's lock: 1850 navigation season						
Squared timber in rafts	55.50	1.00	1.800	54.50	98.10	0.090
Round timber in rafts	22.00	-	-	22.00	100.00	0.030
Sawn timber (fine)	24 143.00	22.00	0.090	24 121.00	99.90	40.300
Cordwood	23 456.00	-	-	23 456.00	100.00	39.200
Other wood products	1 695.00	-	-	-	-	2.800
Total wood:	49 369.50					82.500
Beef and pork	970.50	959.50	98.800	11.00	1.10	1.600
Fine wheat flour	530.00	330.00	62.200	200.00	37.70	0.800
Alkalies (potash and pearl ash)	1 414.00	-	-	1 414.00	100.00	2.300
Salt	1 883.00	1 883.00	100.000	-	-	3.100
Pig and scrap iron	1 136.00	1 111.00	97.700	25.00	2.30	1.800
Fish	414.25	414.25	100.000	-	-	0.600
Merchandise	3 349.00	3 142.00	93.900	207.00	6.10	5.500
Other products	763.75					1.200
Passengers - number	1 550.00					
Total annual tonnage	59 830.00					
St. Anne's lock: 1859 navigation season						
Sawn timber (boats)	38 883.00	-	-	38 883.00	100.00	43.800
Sawn timber (rafts)	6 106.00	-	-	6 106.00	100.00	6.800
Cordwood	22 747.00	-	-	22 747.00	100.00	25.600
Other wood products	2 139.00					
Total wood:	69 875.00					
Salt	3 194.00	3 194.00	100.000	-	-	3.600
Flour	1 584.00	1 390.00	87.800	194.00	12.20	1.800
Barley and barley flour	1 424.00	24.00	1.700	1 400.00	98.30	1.600
Pig and other iron	1 726.00	1 673.00	96.900	53.00	3.10	1.900
Nails	1 076.00	5.00	0.500	1 071.00	99.50	1.200
Coal	993.00	993.00	100.000	-	-	1.100
Potash and pearl ash	934.00	-	-	934.00	100.00	1.000
Fish	773.00	773.00	100.000	-	-	0.900
Pork	468.00	418.00	89.300	50.00	10.70	0.500
Other products	6 629.00					7.500
Passengers - number	13 777.00					
Total annual tonnage	88 696.00					

Articles	Total tonnage	Tonnage upstream	%	Tonnage downstream	%	% of total annual tonnage
Carillon and Grenville canals: 1839 navigation season*						
Squared timber	706.00	-	-	-	-	0.300
Sawn timber	187 030.00	-	-	-	-	83.700
Cordwood	22 380.00	-	-	-	-	10.000
Saw-logs	1 620.00	-	-	-	-	0.700
Other wood products	814.00	-	-	-	-	0.400
Total wood:	211 864.00	-	-	-	-	94.800
Salt	3 138.00	-	-	-	-	1.400
Flour	1 037.00	-	-	-	-	0.500
Wheat	1 100.00	-	-	-	-	0.500
Pig and other iron	2 226.00	-	-	-	-	0.600
Coal	786.00	-	-	-	-	0.300
Sugar	496.00	-	-	-	-	0.200
Pork	436.00	-	-	-	-	1.000
Other products	2 368.00	-	-			
Passengers - number - no statitics						
Total annual tonnage	223 569.00					

* Statistics of upstream and downstream tonnage are not available.

St. Anne's locks: 1869 navigation season						
Squared timber in rafts	700.00	-	-	700.00	100.00	0.200
Sawn timber in boats	249 089.00	142.00	0.060	248 947.00	99.94	66.200
Sawn timber in rafts	3 625.00	-	-	3 625.00	100.00	1.000
Cordwood	90 906.00	-	-	90 906.00	100.00	24.200
Other wood products	5 781.00					93.100
Total wood:	350 101.00					0.200
Flour	2 296.00	2 228.00	97.100	66.00	2.90	0.600
Wheat	762.00	762.00	100.000	-	-	0.300
Salt	2 306.00	2 306.00	100.000	-	-	1.000
Fish	975.00	963.00	98.800	12.00	1.20	0.700
Coal	3 861.00	3 811.00	98.700	50.00	1.30	0.100
Pig and other iron	2 719.00	1 884.00	69.300	835.00	30.70	0.800
Molasses	510.00	510.00	100.000	-	-	0.100
Potash and pearl ash	300.00	-	-	300.00	100.00	
Bricks, lime, and sand	556.00	556.00	100.000	-	-	3.100
Other products	11 738.00					
Passengers - number	22 264.00					
Total annual tonnage	376 162.00					

Ottawa River canals: 1879 navigation season						
Squarehewn structural timber in rafts	2 535.00	40.00	1.600	2 495.00	98.40	0.600
Sawn timber in boats	290 027.00	14.00	0.005	290 013.00	99.99	63.700
Sawn timber in rafts	12 391.00	12 391.00	100.000	-	-	2.700
Cordwood in boats	128 467.00	-	-	128 467.00	100.00	28.200
Cordwood in rafts	360.00	-	-	360.00	100.00	0.800
Other wood products	3 775.00					96.000
Total wood:	437 555.00					1.100
Peas	5 223.00	-	-	5 223.00	100.00	0.300
Oats	1 479.00	467.00	31.600	1 012.00	68.40	0.200
Flour of all kinds	705.00	-	-	705.00	100.00	0.200
Barley	797.00	-	-	797.00	100.00	
Cryolite, mineral ore, and other ore, except iron	4 082.00	-	-	4 082.00	100.00	0.900
Clay, lime, and sand	1 436.00	-	-	1 436.00	100.00	0.300
Other products	4 277.00					0.900
Passengers - number	20 295.00					
Total annual tonnage	455 554.00					

Articles	Total tonnage	Tonnage upstream	%	Tonnage downstream	%	% of total annual tonnage
Ottawa River canals: 1889 navigation season						
Sawn timber in rafts	3 964.00	-	-	3 964.00	100.00	0.600
Sawn timber in boats	550 472.00	2.00	-	550 470.00	100.00	78.100
Cordwood in boats	61 834.00	-	-	61 834.00	100.00	8.600
Squared timber in rafts	4 570.00	-	-	4 570.00	100.00	0.600
Cribs	17 600.00	-	-	17 600.00	100.00	2.300
Cordwood in rafts	6 816.00	-	-	6 816.00	100.00	1.000
Saw-logs	10 382.00	-	-	10 382.00	100.00	1.500
Total wood:	687 333.00					97.300
Clay, lime, and sand	7 832.00	-	-	7 832.00	100.00	1.100
Peas	1 504.00	-	-	1 504.00	100.00	0.200
Cryolite and other ore except iron	1 444.00	-	-	1 444.00	100.00	1.000
Other products	6 999.00					
Passengers - number	16 248.00					
Total annual tonnage	705 132.00					
Ottawa River canals: 1899 navigation season						
Sawn timber (boats)	406 314.00	-	-	406 314.00	100.00	78.100
Cordwood (rafts)	17 390.00	-	-	17 390.00	100.00	3.300
Cribs	40 090.00	50.00	0.100	40 040.00	99.90	7.700
Squared timber (boats)	8 423.00	-	-	8 423.00	100.00	1.600
Squared timber (rafts)	11 300.00	-	-	11 300.00	100.00	2.200
Other wood products	34 205.00					4.700
Total wood:	507 722.00					97.600
Freestone and other stone	2 344.00	-	-	2 344.00	100.00	0.500
Clay, lime, and sand	2 985.00	200.00	6.700	2 785.00	93.30	0.600
Oats	5 613.00					1.000
Other products	5 613.00					
Passengers - number	13 234.00					
Total annual tonnage	520 103.00					
Ottawa River canals: 1909 navigation season						
Sawn timber	197 040.00	280.00	0.100	196 760.00	99.90	58.500
Other wood products	34 985.00					10.400
Total wood:	232 025.00					68.900
Cement, bricks, etc.	42 070.00	1 829.00	4.300	40 241.00	95.70	12.500
Anthracite (coal)	4 706.00	4 706.00	100.000	-	-	1.400
Bituminous coal	26 005.00	25 995.00	99.960	10.00	0.40	7.700
Merchandise	13 619.00	9 837.00	72.200	3 782.00	27.80	4.000
Sugar and salt	4 262.00	4 197.00	98.500	65.00	1.50	1.300
Other products	14 232.00					4.200
Passengers - number	21 731.00					
Total annual tonnage	336 939.00					
Ottawa River canals: 1919 navigation season						
Sawn timber	112 973.00	130.00	0.100	112 843.00	99.90	51.700
Other wood products	1 382.00					0.600
Total wood:	114 355.00					52.300
Sand and stone	76 220.00	-	-	76 220.00	100.00	34.900
Coal and bituminous coal	3 664.00	3 664.00	100.000	-	-	1.700
Merchandise	10 858.00	6 601.00	60.800	4 257.00	39.20	5.000
Other products	13 381.00					6.100
Passengers - number	21 380.00					
Total annual tonnage	218 438.00					

Articles	Total tonnage	Tonnage upstream	%	Tonnage downstream	%	% of total annual tonnage
Ottawa River canals: 1929 navigation season						
Sawn timber	40 259.00	-	-	40 259.00	100.00	7.500
Other wood products	1 021.00					0.200
Total wood:	41 280.00					7.700
Sand, etc.	427 820.00	-	-	427 820.00	100.00	79.700
Coal and bituminous coal	3 916.00	3 916.00	100.000	-	-	0.700
Merchandise	40 083.00	31 807.00	79.300	8 276.00	20.70	7.500
Sugar	5 331.00	5 331.00	100.000	-	-	1.000
Hay	6 676.00	-	-	6 676.00	100.00	1.200
Wines, spirits, and beer	3 158.00	3 158.00	100.000	-	-	0.600
Petroleum and other oils	2 874.00	2 837.00	98.700	37.00	1.30	0.500
Other products	5 899.00					1.000
Passengers - number	22 995.00					
Total annual tonnage	537 037.00					
Ottawa River canals: 1939 navigation season						
Logs, poles, piles, piling	6 447.00	6 447.00	100.000	-	-	2.100
Other wood products	80.00					0.002
Total wood:	6 527.00					2.200
Sand, etc.	152 000.00	-	-	152 000.00	100.00	50.400
Bituminous coal	38 985.00	38 920.00	99.800	65.00	0.20	13.000
Gasoline	66 245.00	66 245.00	100.000	-	-	22.000
Petroleum and other products	15 176.00	15 176.00	100.000	-	-	5.000
Paper	20 067.00	-	-	20 067.00	100.00	6.700
Other products	2 673.00					0.900
Passengers - number - no statistics						
Total annual tonnage	301 671.00					
Ottawa River canals: 1949 navigation season						
Sand, gravel, stone	277 500.00	-	-	277 500.00	100.00	98.300
Bituminous coal	1 495.00	1 495.00	100.000	-	-	0.500
Paper	3 303.00	-	-	3 303.00	100.00	1.200
Pulpwood	32.00	32.00	100.000	-	-	0.001
Passengers - number	8.00					
Total annual tonnage	282 330.00					
Ottawa River canals: 1959 navigation season						
Sand and gravel	327 600.00	-	-	327 600.00	100.00	99.990
Other products	43.00	43.00	100.000	-	-	0.001
Passengers - number	217.00	126.00	-	91.00	-	
Total annual tonnage	327 643.00					
Ottawa River canals: 1969 navigation season						
"Structural shapes and sheet piling"	671.00	671.00	100.000	-	-	96.400
Equipment	25.00	-	-	25.00	100.00	3.600
Passagers	358.00	179.00	-	179.00		
Total annual tonnage	696.00					

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36 PAC, RG43, B1(a), Vol. 102, No. 134392, letter from D. Murphy & Co. to T. Bradly [sic], Secretary of Public Works, 18 May 1891.
37 A glance at the 1889 and 1899 tables (Appendix C) illustrating the distribution by tons of the main articles carried on the Ottawa River canals will show that forest products represented more than 97.5% of total annual tonnage.
38 PAC, MG28, III 16, pp. 90-92, Copy of the Annual Report of the Directors of the Ottawa Transportation Co. Ltd., 8 January 1901.
39 Ibid., p. 91.
40 PAC, MG28, III 16, op. cit., p. 105, 13 January 1903.
41 Appendix C, 1939 navigation season.
42 PCQ, Quebec Canals, File No. 1024, letter No. 4161, 3 July 1934.
43 Ibid.

Conclusion

1 Appendix C, 1829 navigation season.

2 This percentage represents the total quantity of sawn timber transported on rafts and by boat; Appendix C, 1889 navigation season.

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